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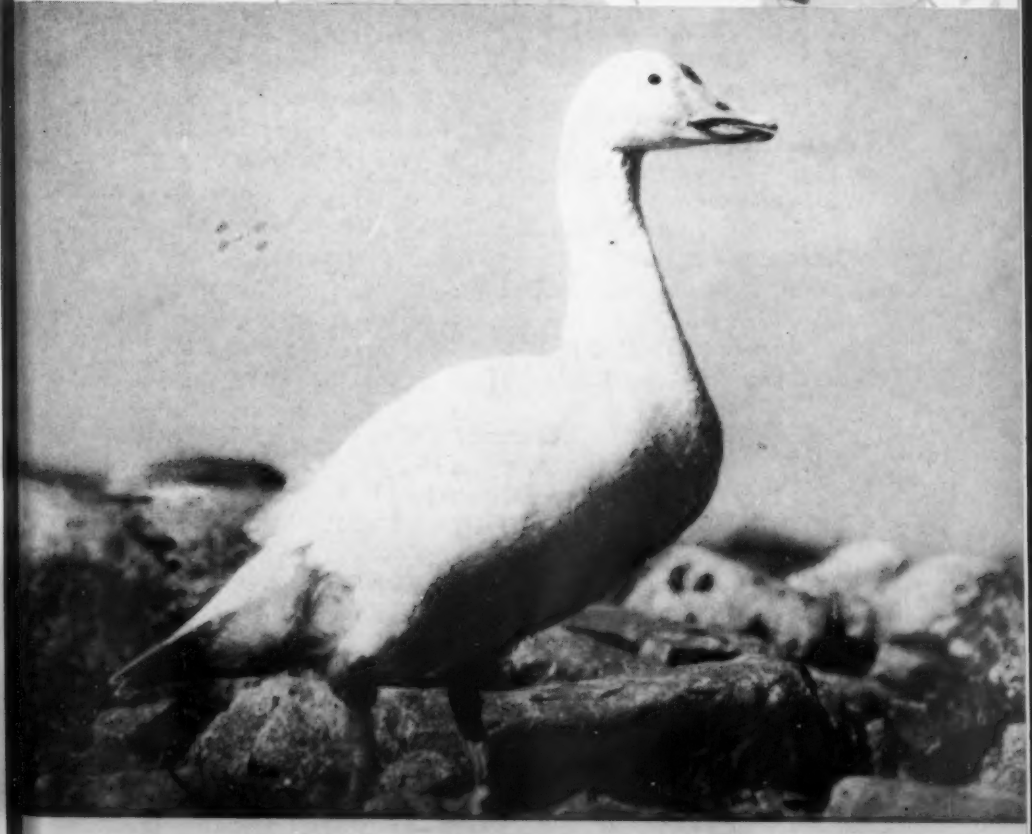

JOURNAL OF THE ARCTIC INSTITUTE OF NORTH AMERICA

THE ARCTIC INSTITUTE OF NORTH AMERICA

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This picture shows only half the village of Point Hope. The row of houses on the left is on one of the two main streets. In the foreground is St. Thomas' Episcopal Church, established in 1890. In the distance on the right is the government school with the teachers' quarters. Beyond the village is the Arctic Ocean stretching westward.

THE AUTOBIOGRAPHY OF AN ALASKAN ESKIMO

Edited by James W. VanStone*

Introduction

THE writer of the following autobiography is a resident of Point Hope, a village on the northwestern coast of Alaska about one hundred and fifty miles north of Kotzebue Sound. Point Hope is one of the oldest and largest Eskimo settlements in Alaska and is occupied by people whose economy depends largely upon the hunting of sea mammals.

The hunting activities of the Point Hope Eskimos vary with the seasons of the year. The small hair seal is hunted at all times when the pack ice lies against the point but most of the other animals important to the economy are migratory, as are a variety of birds. Bowhead whales, walrus and beluga are taken only during the spring while polar bears are hunted on the pack ice during the winter months. Caribou are hunted in the fall in high country a few miles northeast of Point Hope and in summer when they come down to the coast near the village. The time of arrival of the various sea mammals at Point Hope is largely dependent upon the movements of the sea ice, and this is responsible for the cyclical nature of hunting activities.

Hunting huge bowhead whales is perhaps the most important aspect of the Point Hope subsistence economy and requires specialized equipment and techniques. Every spring these animals migrate through Bering Strait and pass near the Point Hope spit as they move northward into the Beaufort Sea. They are hunted from skin boats, just as they have been for centuries, and the blubber and meat are stored in underground caches for consumption during the summer and fall months.

The people of Point Hope have had direct contact with Europeans for nearly one hundred and fifty years, but it was only with the advent of commercial whaling in the Arctic about sixty or seventy years ago that this contact became extensive. Since the collapse of the whaling industry about 1910, the only white men to occupy the area permanently have been traders, school teachers, missionaries and, in recent years, military personnel. Although Eskimo hunting methods and techniques have changed considerably due to contact with whites, the yearly cycle of subsistence activities at Point Hope remains much the same as it was prior to the arrival of European and American culture, and the people are still largely dependent on hunting for their livelihood.

The increased emphasis on national defense in the post-war years has resulted in extensive military construction in the far North. Point Hope men have been successful in obtaining employment on these projects during the summer months and have thus been able to obtain the cash income

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necessary for satisfying wants created by familiarity with American material culture. The fact that construction is possible in northern Alaska only during the summer makes it possible for the men of Point Hope to work away from the village at a time when there is little opportunity for hunting. Thus, hunting is still of vital importance during the fall, winter and spring, with summer employment being integrated into the seasonal round.

I was resident at Point Hope from September 1955 until August 1956 conducting a community study sponsored by the Arctic Aeromedical Laboratory, Ladd Air Force Base, Alaska, and the University of Alaska. During this time the writer of the following autobiography was one of my closest friends among the younger men. At my suggestion, he wrote out the story of his life, a labourious and lengthy process for a person with little formal education and practically no experience in expressing himself in written English.

This autobiography is presented just as it was written except for corrections in spelling and punctuation. The essential features of the writer's narrative style have been retained, but some grammatical errors have been corrected. It is reasonably typical of the life of a young Point Hope man even though the writer has had more experience outside the village than many young men of his age. At various points during the autobiography, explanatory footnotes have been included in order to clarify certain statements and events. However, these have been kept to a minimum.

JAMES W. VANSTONE

This is my life

My name is L. K. I was born on March 16, 1928, at Point Hope, Alaska and I am the son of Chief Attungoruk's daughter.[1] My Eskimo name is Attungoruk.

This is how I have lived for the past twenty-seven years. I don't really know how I lived when I was a baby, but this is how my sister told me I was when a baby. She tells me that I was a restless kid. I think that must be how kids always are, especially boys. She tells me that I used to cry for butter and they used to put about a half inch of butter on my bread. That certainly sounds foolish, but it is true. And there is another thing; I used to eat half a coffee can of raisins. I must have had a stomach like a wolf

[1]Attungoruk achieved considerable power and prestige in the village during the last decade of the nineteenth century through the acquisition of large amounts of trade goods from the commercial whaling vessels that stopped at Point Hope to trade for baleen. He was the primary spokesman for the Eskimos in their dealings with the whalers and is said to have exercised dictatorial powers over his fellow villagers. Attungoruk's downfall came when he began taking other men's wives by force; for this he was eventually murdered.

when I was a kid. Once my sister let me fall off the table. The table was about two and a half feet high. She was holding me on the table and she let me fall off to the floor. She thought I was hurt but I was all right one hour later.

When I was about three years old, I started playing around all by myself. There is a stream about sixty-five yards from our house and my sister said that I used to go home all wet from that stream. I must have been an awful one to take care of as I was always getting my clothes wet. When I was about four years old I started following my father when he hunted ducks.[1] He said I used to get in front of his shotgun and then I would get a scolding from him. After that happened a few times, he didn't want me to follow him any more.

Once, I remember, when I was about four and a half years old, I was in the corner all day for stealing some bread; I was in the corner all day without eating. This was kind of tough for me so I stopped stealing bread. Sometimes my father would try to tell me how I should live and how he wants me to be. But it didn't seem to get into my head somehow. All I wanted to do was play around with the boys.

I never used to like to listen to people who talked about God. All I wanted to do was keep away from them. I guess I was just a wicked little boy. Yes, I did things I shouldn't do, and stayed away from good things. There was a priest that I didn't like very much. I used to try and keep away from him and he used to always give me a bad time when I went to church because he wanted me to listen when he started preaching. I used to swear at him in my mind; I sure hated his guts. I sure was wrong when I did those things to the preacher. I even used to make faces at my Sunday-school teacher if I didn't want to stay in church any longer. I sure hated to go to church, but I knew if I didn't I would really get the worst punishment from my father. One time at Christmas I was the only boy who didn't get any candy from the mission because of being disobedient in church.[2] Also I got lots of spankings from my parents for doing those things,[3] and from the missionary too!

Sometimes I would try my best to be a good boy but pretty soon I would wind up in some kind of a mess. Once I was playing out with the boys and we were throwing rocks at the poor birds. I accidentally hit a bird with a rock and killed it and that was my first bird. My mother put up

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[1]This is a considerably earlier age than most Point Hope boys begin hunting with their fathers. However, since duck hunters do not move around a great deal they occasionally take their very young sons with them and the child will be expected to sit very quietly and not disturb his father.

[2]St. Thomas' Mission of the Protestant Episcopal Church was established at Point Hope in 1890. It is the only church in the village.

[3]This seems to be an unusual reaction to church attendance. Most young boys seem to like to go and particularly enjoy Sunday-school. However, the situation doubtless varies, and is probably dependent somewhat on the personality of the missionary who is in residence. Today, Sunday-school and church attendance does not seem to be compulsory in most families but attendance at the former is high.

a little feast for the first bird that I killed, since that is the custom.[1] When a boy gets his first seal or any kind of animal, they always put up some kind of feast.

When I was about five or six years old I used to trap ground squirrels in the falltime about a mile from the village. I was doing okay but I was always too lazy to skin them. My father told me that if I didn't skin them he would take the traps away and that made it hard on me. I liked to trap but I had to skin them. So I started thinking about it. There were some other boys trapping with me so I started giving the squirrels away instead of taking them home. Now that is a funny way to hunt, but I was doing it for almost a season. When I didn't give them away, I sold them for some toys. One time I sold three squirrels for a bow and arrow. Once in a while I would take one squirrel home when I felt like skinning it. Then one day I came home from trapping with one squirrel. I washed my hands and went over to the cupboard and was going to fix something to eat but my dad said to wait a minute. He asked me how did I get my bow and arrow. I figured that he must have found out already so I told him the truth. Then he asked me why I sold the squirrels, and I told him that I was too lazy to skin them. He took his belt off and started spanking me until I cried. I think my sitter was kind of blue that evening, but I asked for it so he gave it to me real good.[2]

When I was six years old, I started going to school. The teachers were kind of strict. My father talked to the teachers and told them not to be afraid to punish me if I was a bad boy. So I was doing all right until it started snowing. We used to throw snowballs at each other during recess-time. One time I was throwing snowballs at the girls and I hit one girl right on the eye with a hard snowball. She told the teacher, and he made me sit in the corner all afternoon with my head down. He told me that I would get it worse if I did something like that again. So I started watching my step from that time on. I was doing fine until I saw one of the boys playing a mouth organ. I sure wanted one like that but my father didn't have enough money to buy one. I knew that this boy always left it in his jacket pocket in the storm-shed so I asked the teacher if I could go to the toilet. He said that I could so I took the mouth organ out of the boy's pocket on my way to the toilet. I thought I was going to get away with it. Later on people found out and I was in a bad spot this time. I got three spankings

[1]In former times, it was customary for the community to recognize the emergence of a new hunter. The first of any species of bird or animal was usually given away to the old people whose good will was essential for the continued success of the young hunter. Today, some families still observe this custom but most do not, although there is usually some recognition of the event by the family. Occasionally, at the time of the spring whaling feast, gifts will be distributed by a woman whose son or grandson killed his first animal of any species during the preceding year.

[2]Discipline such as is described here is probably rare in the village. Active, responsible participation in the affairs of the household at an early age is conducive to the early acquisition of an adult outlook and discipline seems to play a relatively minor role.

in the same day; one from the teacher, one from my father, and one from my sister. Man, I couldn't sit down for almost a week! I swore to God I wouldn't do anything like that again.

Well, the days passed and I was trying to live like a good little boy. In wintertime, after school was out in the afternoon about 3 P.M., my mother always told me to stand outside the door and watch to see if my father was coming home from hunting. If he was dragging a seal then I would meet him on his way home and help him drag that seal. I think every boy does that after school. If he didn't get any, my mother would go to some people and get us something to eat. Everybody does that sort of thing. I mean, the mother of the house goes out to beg some food for the family if her husband doesn't get any seals. Sometimes our family would have a very hard time if the weather was bad and there was no seal hunting and no seals to eat. Sometimes we would have lots of things to eat, but not all the time. Yes, I guess I was hungry lots of times. But it sure is good to have friends around the village because the people always share with each other and that is a good deal for them.[1]

In the evening about 6:30 or 7:00 P.M. the older boys would gather and start playing football and I would be one of them too. I wasn't a very good player, but they would choose partners and would always choose me too. Then we would start playing football at night.[2] It was dark, but there would always be moonlight and we would play until about 9:00 P.M. That is when the curfew bell always rang. I sure used to hate that curfew bell because I liked to play out, but we had orders from our parents that we had to be home by 9:00 P.M. on school nights. If we didn't go home on time maybe we would really catch it.

Then in the springtime, maybe around the last part of May, my father would make me a sling for duck hunting. There are always lots of ducks at that time of year. It is lots of fun to hunt ducks when the weather is warm. I would go out duck hunting with the sling and sometimes I would get one and sometimes nothing. Sometimes there would be wounded ducks out on the ice and I would go after them and catch them. Then when I got home I told my folks that I got the duck with my sling, and that was a lie. I got by with that part because they didn't know how I got the duck.[3] Sometimes I got three or four wounded ducks and I told them I got them with my sling. I kept that lie a secret until I was about twenty years old.

[1]Sharing is an important aspect of life at Point Hope and families who are hard pressed to obtain enough to eat often rely on relatives and neighbours to help them in time of need. Such sharing may take the form of borrowing food and supplies, or members of a hard-up family may simply "visit around" at meal times.

[2]Eskimo football is a game which bears more resemblance to soccer than it does to American football. The goals are several hundred yards apart and one team tries to kick the ball across the other team's goal.

[3]Today small boys shoot at the shore birds that frequent the slough that runs through the village. A surprisingly large number of birds are killed, and the youngsters achieve considerable accuracy, sometimes at great distances, with their slings. It is doubtful whether such slings could be used against relatively high flying ducks. Birds grounded by shotgun wounds are, however, occasionally killed by children with slings.

I was almost eight years old when I started smoking. Once I was smoking in the old well with some other boys and an older boy caught us.[1] He told my parents and my father went after me with his belt. I tried to run away from him, but he caught me and smacked me with his belt right on my butt. Then he took me home and I was walking ahead of him just like a prisoner. But it was my own fault because I just didn't know how to stay away from a sinful life.

My mother would tell me to wash my own clothes every Saturday. I got six sisters but I still have to wash my own clothes. My father told my sisters not to wash my clothes until I learned to be a good boy. Sometimes I would be so mad that I would just dump my clothes in the tub and rinse them out and hang them up. So I still wore dirty clothes after I washed them.

Also when I was about eight years old I started learning how to gamble. Several of us boys would get together at some place where no one would see us and one of the boys would have a deck of cards. We would play for anything. Sometimes it would be cigarettes, pipe tobacco and other little things. When I went home, I would put them behind the house and cover them with sand. But sometimes I would lose a lot of little things and maybe they would be my mother's cigarettes and my father's pipe tobacco. I used to get these things on Sunday evenings because my parents always visited friends and there would be nobody at home. I would sneak in the house and take about a pack of cigarettes and some pipe tobacco. Man, I really was a sinner in those days!

Then one evening another kid and I were playing on the beach and it was about 10:00 or 10:30 in the evening in summer. We got into a skin boat that was pulled up on the beach. I happened to have a pocket knife with me so I told my boy friend that we should cut a hole in the skin. He wanted to do it too so I took out my little red pocket knife and cut a hole right in the bottom of the boat. He cut a hole too, right next to mine. When we were leaving, somehow I dropped my knife and I didn't miss it until the next day. This knife was given to me on my birthday by my brother-in-law. So the next morning I woke up and was getting some water. When I walked in the house with the bucket, there was my sister sitting on a chair. I didn't pay any attention to her until she asked me where my knife was. I said that it must be around the house some place. She told me to start looking for it but quick. I started looking for it but I couldn't find the darn thing. I didn't even know that I had dropped the knife. While I was looking, my sister said, "What's this?" and she showed me the knife. I think my face was just red when she showed me the knife. Then she wanted to know where I was yesterday and I said, "Oh, playing out with the boys." And she said, "You sure must have played out when you cut a hole in the skin boat. Why did you do it?" Then she started slapping my hand. I

[1]Smoking is taken up by a number of older schoolboys without, or in spite of, parental objection, but the teachers do not allow smoking in the school building at any time by school-age boys and girls. Most smaller children are aware of the fact that smoking is considered "not good for kids."

couldn't pick up anything the next day my hands were so swollen. Yes, I sure did get all kinds of punishments, but my life never changed at all and I don't know why.

After that my father gave me a job to keep the water buckets full, chop wood every day, and feed the dogs every night.[1] Those jobs sure fixed me up; I mean I was tired every night and hardly stayed out in the evenings. And I was only eight and a half years old when I was doing all that work.

At about my ninth year I started hunting seals in the springtime and that was fun because I love shooting and I wasn't such a bad shot. But the first seal I got, my parents gave it away to some old woman and she thanked me for it. Of course, I was a little disgusted when someone took my first seal away from me. But that has been the custom from the beginning.

Well, there was another thing I had to watch — my shells. I had a .22 cal. single shot rifle and my dad always told me not to waste my shells. I loved to shoot with my .22 but my dad always counted the shells before he gave them to me so he would know how many times I missed. If I missed a lot of times I would get a scolding for missing those seals. He was wrong on that part because I can't learn to use a gun that way. However, I couldn't explain it to him because I knew he would get mad if I tried.

Then when I was about ten years old I started shooting a shotgun. I was a pretty good shot with that shotgun. Sometimes I would get three or four ducks with one shot, and that's pretty good for a ten-year-old kid. My shotgun was a double-barrelled, 20-gauge and I was better than some of the other boys. I knew one boy who used fifteen shots without getting even one duck. That was kind of bad luck for him. I think I would get bad punishment if I was that unlucky with my shooting.[2]

Now I think I will tell you how I hunted when I started hunting alone. It was springtime, about the first part of June. My father was out on the ice during the night, and when he went home he woke me up and told me to take over.[3] It was about 9:00 A.M. when I jumped out of bed and started making coffee for my father. After I made the coffee, I drank a cup and had a little meat for my breakfast and then I went down to the ice to where my father had been sitting. While I was sitting on a piece of caribou skin on top of the ice, it started getting foggy. I couldn't see a thing that was more

[1]A boy begins to be helpful around the house when he is about eleven or twelve years old, although sometimes as young as eight or nine if he has no older brothers. He will get up first in the morning to make coffee, and will do other chores such as filling lamps, hauling water, and feeding dogs. A boy of twelve or thirteen can be of great assistance in the family, leaving the adult males free to devote full time to food getting and household activities requiring skill and experience. The age at which a child begins to make important contributions to the running of the household largely depends on the number of older brothers and sisters he has.

[2]Punishment for lack of skill in hunting seems to be rare. A boy is usually not entrusted with a large supply of expensive ammunition until he has proved his ability as a hunter.

[3]When seals are plentiful in the late spring, hunting is carried on continuously to take advantage of the long hours of daylight.

than twenty-five feet away from me. This was the first time I had ever been out on the ice alone and I began thinking about which way I would go home. The seals would come up through the water, but I wouldn't take a shot. All I was worried about was the fog and which direction I was sitting. Good thing it wasn't windy that time or I could have drifted out. I didn't make a move that day until about six in the evening. Yes, I could have been a dead duck that spring or a feast for the seals. What a hunter! Didn't even get a duck that day. All I worried about was my life and I was scared to death.[1]

Not very long after that, in falltime, I was out hunting owls with my .22 rifle. I shot one about one hundred feet away from me but when I got close to it, its eyes were as big as marbles and I got scared. I think the owl was dead but I just left it there. Yes, I was quite a hunter in those days. When I was in school I used to hunt only on Saturday. Sometimes I would get only five .22 shells from my father. He didn't want to give me a whole box because he knew I would finish it for nothing. Sometimes I sure did get mad at my father but I couldn't say anything to him.

When I was about twelve years old we used to play out in the evenings by the store. There were about three or four boys and I was one of them, the worst one probably. There were a lot of empty drums outside the store. The lids were loose so we opened one and started inhaling from those drums. Well, I think I was the first one to do it and those other boys went right ahead and started inhaling too. We sure did get drunk with it.[2] Well, we thought we had our fun, but we weren't doing our bodies any good. We were just shortening our lives. Yes, some people sure get crazy, but I don't think kids will ever beat me around here.

Then I became a lover. What a lover! That is the time when I had my fun. We were in school and I happened to sit right behind the girl and she was as pretty as a doll. Well, one day in the afternoon I was a little late to my lunch. All the other school kids were gone already and she and I were all alone in the school storm-shed. When I looked at her she was smiling at me so I just grabbed her and kissed her. She wasn't even trying to get away from me or anything. When I went to eat my lunch I couldn't forget her. Sometimes I even smiled to myself because it was my first kiss and I was proud of it. Pretty soon it was Valentine's Day. We had our games and danced and they started passing the Valentines. As they passed them they passed me one too! It was a pretty one. It was folded so I opened it and read who it was from. And by golly, it was from the girl I kissed! I didn't do anything to her right away but in the evenings we always played out until 9 o'clock and she always played out too. So I started watching her to see when she would go home, so I could take her home. I watched and

[1]Boys are seldom allowed out on the ice unless accompanied by an adult, since the strong currents that pass the Point Hope spit are constantly moving the ice making it extremely dangerous even for experienced hunters.

[2]Inhaling gasoline fumes produces light-headedness and causes an individual to appear intoxicated.

finally she started off toward her home. I sneaked away from the boys and went around the other direction and caught up with her. I grabbed her around the neck and kissed her. I mean we were in love, so I took her home and we stayed outside the door for awhile. I kissed her quite a few times and went on home.

Well, we were friends for quite a long time. Sometimes we would go to church together. That's the evening service because nobody would see us in the dark. And she used to tell me not to go around with other girls. I tried to do everything she said because I wanted her for myself.[1]

When I was thirteen years old, my parents went camping about five miles to Jabbertown in the springtime to hunt seals and ugruks.[2] All of us went camping for about two months. Well, there was another family camped near us and they happened to have a girl about my age and she wasn't bad looking. So we used to go to church in the morning and it would take us a long time to walk up there. After church we would go to the village and eat our lunch and then I would walk back to Jabbertown with this girl. While we were going home, there was nobody around and the first thing I knew I was making love to her. Now I am getting to be a two-timer. Every time when we played out and both my girls were there, I left them alone. I had a hard time trying to be nice to them because if one of them found out, I would lose both of them. One Sunday when we were going home to Jabbertown together she started telling me not to look at the other girls. So I told her that if I'm not going to look at the other girls, I'll just leave her alone. Then she started crying and told me not to leave her alone. After we finished camping and started moving to the village, she went over to me while I was alone and gave me a pair of yarn gloves; they were pretty ones too. And I began to worry how I would act when we got back to the village. This second girl I had was really in love with me. I wanted to tell her that I got a girl in the village but I didn't know how to start.

Well, when school started, my first girl found out that I had another girl and boy, did she blow her top! She wouldn't even look at me any more. The same day my second girl found out that I was going around with another one. Man, was I in a mess. Nobody loves me and no girl friend. So I went without a girl friend for about two months and then my second girl friend came back to me.

Well, a damn fool like me had to quit school while I was in the fourth grade. The reason why I quit school was that my father was getting old and

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[1]The writer seems to have exhibited an interest in girls sooner than most Point Hope boys, but it is true that school romances are not rare. Since overt love making is not part of the cultural pattern, the attempts at secrecy described by the writer must be fairly typical.

[2]In early June, following the spring whaling feast, many families move down the spit in the vicinity of Jabbertown where they live in tents for most of the summer. Since the shore line in that region is slightly indented and free from strong currents, the ice remains longer and seal hunting is better.

he couldn't hunt much and we would be hungry before he got his cheque.[1] He was getting $15 a month from the government for his old-age assistance. We were getting mail only once a month when the weather was good and sometimes we didn't get mail for three months, and that is a long time to wait for a cheque. So I felt sorry for my poor father and I started hunting too. Well, he wasn't sorry for me when he used to give me all that punishment, but I felt sorry for him. Sometimes we would have nothing in the house; nothing to eat, no fuel and it would be like that for a long time when the weather was bad. I wasn't very lucky in hunting because I couldn't stand the cold weather that time when I was a young kid. Besides, my gun wasn't very good and I didn't know all about hunting. Some days I would get two seals if I was lucky, but sometimes I would get nothing day after day. I would have to go home with nothing after walking all day and my poor mother would be visiting people for something to eat day after day. Sometimes I would go to some of my relatives and have supper with them. So I think it is very good to have friends and relatives.

Well, I was doing fine with my girl friend for a long time. We got along fine and I don't fool around with other girls any more. Then I found out that my girl was two-timing me. But I didn't really care much, and I just let her go the way she wanted. I was fifteen years old and going around lonesome looking for the one girl that I could trust. Early in the spring when I was fifteen my father got sick and then I was on the spot because I had to do all the work. I mean I was taking over my father's work and I wasn't taking it easy at all.

One night there was a dance at the school and while I was dancing around, I danced with a girl about three years younger than me and she wasn't bad-looking at all. I always heard from people that she was a good worker and pretty smart in school. So I got around to her once in a while and finally started going around with her. I knew she used to knit with yarn and make good gloves, so I asked her to make a pair for me. It was the best knitting I see in my life so I paid her $1.00. Well, a dollar used to be a lot of money in my younger days.

I was getting happier every day but my father was getting worse. My mother was taking care of him as best she could but he was getting worse. Finally the teacher sent him to the hospital and about two weeks later he passed away in the Nome hospital. What a sorrowful day for us when we got the news but we couldn't help it. I started thinking to myself how I am going to take care of my mother and sisters. I wasn't able to go to work to earn money because I was a little too young. So the next summer I went

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[1]Since the writer was the only boy in the family and the youngest child, it was doubtless necessary for him to take a more active part in the support of the family at a relatively early age. At this time, Old Age Assistance cheques were considerably smaller than they are at the present time. Today, territorial law stipulates that a person must remain in school until the age of sixteen or until the eighth grade is completed. Many young Point Hope men simply leave school when they reach the age of sixteen and then will try to rationalize their action as being due to family necessity.

to Kotzebue for about a month to try and get a job longshoring.[1] It sure was a big help for us but it wasn't enough for the winter. So I started carving ivory bracelets and sold them to the native store. It was a great help to us when I sold them.[2] So we got along pretty good during the winter, and my girl friend and I were getting along fine too. Sometimes I would buy her something from the store after I sold the bracelets. Sometimes I would sell one bracelet for $9.00 or $10.00.

I was sixteen years old when I got a white fox. I was hunting one day and as I walked along the ice I saw a white fox. It was running toward me so I stopped and took my gun out of my gun case and while I was trying to take it off, the fox saw me and started to run away. I started running after it with my gun. I ran and ran for almost an hour and got ahead of it. Then I stopped behind an iceberg to wait for it and a few seconds later it came along and was only about fifty feet from me. I shot it right there. Boy, was I tired! I sat there for about twenty minutes and smoked my cigarettes before going home with that fox. I was sure happy and after I skinned the fox and dried it, I sold it to the store for $12.00.

When summer came I didn't go any place to work because I was making pretty good money carving ivory. When big boats came in, the people would go out in their skin boats and sell ivory to the white people. Well, I would be one of them too and sometimes I would sell four or five bracelets and some other little things. We would get about two or three ships in the summertime. Sometimes I would be tired of carving but I knew if I didn't do anything, we would be hungry again. Yes, I found out how hard my father was working when he was taking care of us and how hard he worked to keep us warm and lively. And I also found out how hard my mother worked to keep us from being hungry. She used to walk around to people and beg for some food, but still I gave her a bad time. But when I started making a little money, I tried my best to pay her back and see that she had plenty to eat and smokes and clothing. But it was not enough yet. Well, I did the best I could to try and help my mother, but not my father. I would try to pay him back too if he had lived longer, but his life ended before I could start helping him. Why did I do those bad things when I was a boy? But it is too late to worry about it now.

I was seventeen years old when my girl told me in falltime that she was going to school at White Mountain. Well, I told her not to go, but her parents were the ones who gave her orders, and I couldn't do anything about it. She said that she didn't want to go, but her father wanted her to go to school. I knew it would help her, but I didn't know whether she would be my girl when she came back. I liked that girl so much that I sure did hate to see her go away from me. Now what shall I do? Shall I get another

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[1]During the summer, when boats are unloading supplies for the stores in Kotzebue, there are employment opportunities for boys as longshoremen. At the present time the wage rate is $1.75 an hour, but ten years ago it was much lower.

[2]Some villagers make considerable money carving ivory bracelets and disposing of them through the village store.

girl or shall I wait? Well, the spring came and I went to Kotzebue because she was heading for White Mountain to school.[1] Now what shall I do? So I told her that I would wait for her until she came back, even if that is a long time. She told me the same thing and left the next morning; so now I was alone.

Well, I finally got to be eighteen years old so now I could go to work to earn money. It was kind of hard for me the first time that I started working. I went to Candle and got a job at the mining company.[2] I used to get scared of some of the boys when they got drunk, but I never used to drink that time. Later on one of the boys started asking me to take a shot of whiskey. I refused it because I was scared I would get caught by some of the older people around the mining camp. That boy told me that one shot of whiskey wouldn't make me drunk. So I took it. Now that was the first drink I ever had and I thought I would never take another.

Well, I worked and I was getting along well with my boss. I was blasting ice with dynamite and was getting more money than the other boys who worked with me. My job was over about the middle part of September and after that I was paid off and I went to Kotzebue. I had meant to go home that month but I got stuck in Kotzebue. So finally, I went to Nome instead and started working again. Yes, that was the first time I ever saw a city and I thought it was a very big city. I had a good time in Nome until I took a drink. It was wine and it tasted good at first, but two hours later I passed out cold. When I woke up I was on a very hard bed. Yes, I woke up in bed and it was in jail. Boy, did I have a hangover! I had been paid by my boss the night I got drunk but when I woke up, my wallet was gone. I didn't have anything in my pocket and I was worried about my money. It was more than $80.00. It must have been 8 o'clock in the morning when someone woke me up. About 1 o'clock a policeman took me upstairs. When I went into the court room the judge was talking to me with a cigarette in his mouth. It didn't seem as if we were in the court but in a private house talking to each other. I never heard of a judge smoking in the city hall and I sure was surprised to see him smoking. Well, he turned me loose but said that if I was caught again, I would have to serve some time until I could learn to be good. It was too much for me to stay even over night on those hard beds with no mattress. I got out of that mud hole the next day and got my money back. The police gave it to me just before I got out and I really was happy. I didn't celebrate though, but went home right away and hit the sack.

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[1]The Alaska Native Service formerly operated a school located at White Mountain, Alaska. At a time when the Point Hope school taught only the first six grades, it was necessary for an individual who was interested in going to high school to complete the seventh and eighth grades at White Mountain before entering the high school at Mt. Edgecumbe near Sitka, Alaska.

[2]Today there is relatively little gold mining at Candle but in the days before the post-war construction boom, it was one of the main sources of summer employment for men from the coastal villages.

Well, it was just about springtime when I went back to Candle to work and I figured I would go back home after I was through working. I worked until September again and then went to Kotzebue. I was going home but went to Fairbanks instead and got a job working for the Alaska Railroad. When I first got to Fairbanks, I thought it was a beautiful place. I didn't know which way to go when I first got to town and I was all alone on 2nd Avenue. There was a married couple from my home that lived in Fairbanks and right away I started looking around for them. I finally found them and sure was glad to see them.[1] When they first took me to their home, I didn't know which way they were leading me. But anyway, we got to the house and there was enough room for me to stay there. They had a son and they told him to get my baggage from the airport which was at Week's Field. After we ate our supper they took me to town and started showing me around the town. Yes, I saw all kinds of people; good-looking, bad-looking and ugly-looking. So we went to the movie and then went home. Yes, I sure did see things that I never saw before. The only places I wanted to go was to a movie and pool halls: no bars!

Well, I worked until the last part of November and I sort of wanted to go home but still I liked Fairbanks better than my home. Yes, some people can get crazy just for little things. So I spent my Christmas in Fairbanks and sure had lots of fun. Finally, in January, 1948, I got another job and went to work for the Alaska Railroad again. They took me down between Fairbanks and Anchorage and I was on a section gang making $1.47 an hour. I had a good place to save my money out there where there was no place to spend it. I was getting along fine with my boss and he liked me too. So I stayed on that job until about the middle of May and had saved almost everything I made. Then I went to Anchorage. Yes, Anchorage was a bigger place than Fairbanks and I liked it better than Fairbanks. I stayed in Anchorage for about one month without doing anything. I couldn't get a job but I had enough money to fool around. Well, later on I got a job, and this time I started working for the bus station. I was a grease-monkey this time. They started me at $120.00 a week so I was making pretty good money. Yes, I was saving money all the time and I never spent any of it for liquor. After I spent the night in the Nome jail, I had enough.

I worked until about September and then went back to Fairbanks again. Yes, I was quite busy in those years. That same fall I got a letter from the Alaska Railroad that my job was open any time I wanted to go to work for them again. So I just took my old job again. That winter I wrote to my girl and told her to go to Anchorage in springtime. I told her I would be there the first part of June. But she didn't come, and she told me in her letter that she might not go back to school if she went to Anchorage. Yes, I was twenty-one years old now and I thought I might marry her when she came to Anchorage. She was pretty smart about that because

[1]When people from Point Hope come to Fairbanks they always stay with one of the three former Point Hope families now living there.

she knew I would ask her if I saw her in person. But still it was good for her to be in school a little longer. Yes, I saved a lot of money because I thought my girl might come to Anchorage. I was quite anxious to get married but it didn't work out that way. I didn't want other girls either. I figured I might get her some day if nobody beat me to her.

In January of 1950 I started working for Wells Alaska Motors in Fairbanks, but I didn't have such good luck that time. I hurt my right knee; didn't break it but just cut a few spots on the knee and stayed in the hospital until February. I didn't try to go back to my old job but started looking for a new one. Well, I joined the Culinary Worker's Union and got a job at Eielson Air Force Base as a dish-washer. It was the 8th of February when I started working for Universal Foods. I worked two weeks there as a dish-washer and then they put me on cook's helper. Well, I would peel potatoes and onions and get them ready for the cook. I was working about one month as cook's helper and then they made me a second cook. Yes, I was making $56.00 a week and finally $112.00 a week, and I was cooking until August, middle part. Then I got transferred to Cape Lisburne and that is only about forty or forty-five miles from my home. I was happier when I got close to my home. I was twenty-two years old when I went to Cape Lisburne and lots of boys from home were working there. Boy, I sure was glad to see them after all the years I been away from home. But what did I do? I started drinking to be happy with them. Yes, I was drinking almost every day when I got to Cape Lisburne. I was crazy, but it is my own life. Three weeks later I was fired by my boss. So I went home that same fall with $150.00 in my pocket. Of all those years of working, where did the money go? To liquor. What a shame on me that I went home with nothing but the liquor I got in my suitcase. Yes, it's no fun to be dumb like me. For all those years I had been working for nothing! Besides, my mother was still living and I didn't even buy a present for her! Now a young man like me should know better than that. But I will not go back and do it over again. Yes, I sure had a lesson from that kind of life.

Well, I stayed home that fall and fell in love with another girl. She was quite young but she was sure a pretty girl. But I didn't know that she had a boy friend. I told her to keep away from him but she didn't listen to me. So I was twenty-three years old when I started waiting again for my old girl friend. I heard that she went to Fairbanks after I left there.

Well, in springtime I went to Kotzebue again. This time I started working for A. R. Ferguson. I was working on the boat as a deck hand and was getting $175.00 a month. I was doing fine when they were boating around Kotzebue Sound, but on September 24, we took off from Kotzebue for Cape Lisburne and stayed up there for ten days but didn't land because the wind was too strong and so we went back to Kotzebue. When we got to Kotzebue there was a barge for us to take to Seattle. I thought that now I was going to have my fun and a trip to the States, but it was upside down fun. Yes sir, I was boating clear down to Adak Island but I was hungry

most of the time. Sometimes we had beans for breakfast, lunch, and supper. I have been working all my life, but I never got hungry on the job. This time I got so hungry that I even ate a raw potato. So, when we got to Seward, I jumped ship and took off to Anchorage again. I got a job on the Alaska Railroad in January, 1953.

While I was working I got a letter from my sister that my girl friend was home again. I couldn't believe it for awhile so I sent her a Valentine card to see what she would say. Well, there was no answer. So I worked until the middle part of March and took off for Nome. I was very anxious to get home but I had trouble in Nome. The taxi I was riding in got into an accident and I wound up in the hospital for almost two weeks. So finally I got out of the hospital and took off again for Point Hope and got there on the 9th of April.

When I got off the plane, I looked all around for my old flame but I didn't see her at all. I was wondering what happened to her. Well, I visited my friends and I finally saw her but we didn't say a thing to each other. I think we were both bashful. The next night they had a dance so I danced with her and I was plenty nervous. I kept my eyes on her every day.

Then it was time to hunt whales and there are usually eight people in one whaling crew and a cook makes nine.[1] My girl was the cook in the same crew that I was in so now I had a chance to talk to her. When night came around we had a tent, and a stove burning to keep us warm. Finally everybody went to sleep and I went over to her and we started talking. Sure enough, she had been waiting for me to say something. We planned to get married the same summer. Finally it was May and we got together but we weren't married yet as we were waiting for a license. Yes, I think I got what I wanted when I waited for my girl. It was June 11, 1953 when we were married.

Yes I thought I was ready for living but I wasn't. We didn't have a thing in the house when we first got married. All we had was a bucket, two or three cups, and a set of silverware. I was getting $60.00 every two weeks and my wife $60.00 a month from unemployment compensation and every time we got a cheque, we bought some dishes and food. Then I began to find out how hard it is to make a living for my own family. But at least we had our own house.[2] It had been my parents' house, but my mother was living with my sister.

Finally we had a baby on February 4, 1954. Yes, we had a son and his name is Henry James K. Yes, it sure was fun to have a sonny boy. I

[1]The writer is referring to the whale hunting crews, to one of which every adult male in the village belongs.

[2]Although matri- or patrilocal residence is an economic necessity for most of the young married couples at Point Hope, neolocal residence is the ideal. Every young couple wants a house of their own and sometimes they are provided with one long before it would be economically possible for them to buy or build by the death of parents. Since the writer was the only male child, he automatically received the family house when his sisters married and his mother went to live with one of them.

hardly did anything after we had that baby. All I could do was stay in and watch that baby for almost two weeks. I just couldn't believe it. Yes, it's hard to be a father when you have to keep your family warm and feed them too, but I don't mind at all.

Yes, I was doing fine until I went up to Barrow in the spring of 1955, but I came home in October because my mother had gone to the hospital. But the same day I got back, the doctor sent us notice that my mother was gone for good. Now I have no mother and no father. Yes, it is hard to make a living, but worse to go without parents. It is easy to find food and fuel but hard to find parents after they have passed away.

I'm willing to make a good clean living but I'm not able to work right now because I had an operation not very long ago. But when I get well, I want to help my friends and neighbours because they are helping me now. I'm getting better every day and I will help my friends as soon as I am able to work.[1]

Not very long ago I had another son. He was born on November 16, 1955. Now I have two kids of my own and one lovely little girl that we adopted. She is four years old and I love her a lot. Yes, it is a lot of fun to be married. Once in a while we get hard up on our groceries but we always get by somehow.

I think this is it. I haven't done anything today, but now I am signing off until I don't know when.

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[1]The writer worked away from the village for longer periods of time than most young men. His experiences show the wide variety of employment possibilities open to villagers and which are taken advantage of by those young men with a good command of English and without close family obligations. Men with families prefer to work away from the village only during the summer months. It is significant that L. K., now that he has a family to support, never leaves the village to work except during the summer. If he wishes to continue living in the village, and nearly all Point Hope families do, he must hunt during most of the year as the income he earns during the summer is not enough to support his family for the rest of the year.

THE KILL OF WILD GEESE BY THE NATIVES OF THE HUDSON-JAMES BAY REGION

Harold C. Hanson* and Campbell Currie†

THE health and economic plight of the Indians and Eskimos in northern North America in recent years have become matters of increasing concern to the governments of Canada and the United States. Because wildlife continues to be the basic resource affecting the general welfare of these natives, its preservation and sound management assume an importance unequalled elsewhere on the continent. In the Hudson-James Bay area, wild geese constitute a significant part of the wildlife resource. This paper attempts to appraise the importance of the goose kills to the Indians and Eskimos and to the various goose populations involved.

Most of the data were gathered by the interview method. This method of assessing kills is subject to inaccuracies because of the tendency of some natives to report their kills in round figures. Winter inventory figures of goose populations cited here also contain a margin of error. Nevertheless, as both kill and population figures were obtained in the same manner in succeeding years, they should be fairly comparable from year to year.

Acknowledgements

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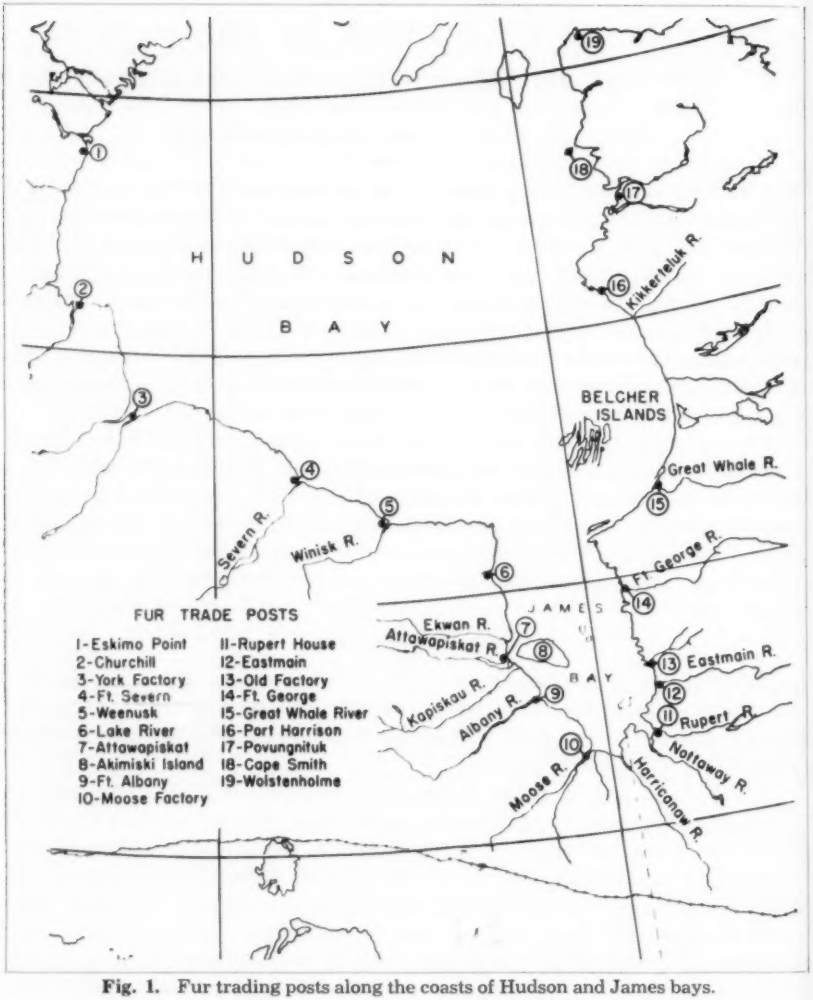

Fig. 1. Fur trading posts along the coasts of Hudson and James bays.

Region of Study

The region under discussion includes the trapping grounds of the natives whose headquarters are at coastal fur trading posts of Hudson and James bays from York Factory, Manitoba, to Cape Wolstenholme, Quebec (Fig. 1). It also includes inland portions of the western part of northern Ontario and adjacent portions of Manitoba (Fig. 2), north of the transcontinental line of the Canadian National Railway. Cree Indians hunt most of the wooded areas of Ontario and Quebec adjacent to the bays and a small number of Ojibwa Indians hunt in the southwestern part of northern Ontario and adjoining portions of Manitoba north of the C.N.R. Eskimos hunt along the eastern coast of Hudson Bay from Cape Jones northward.

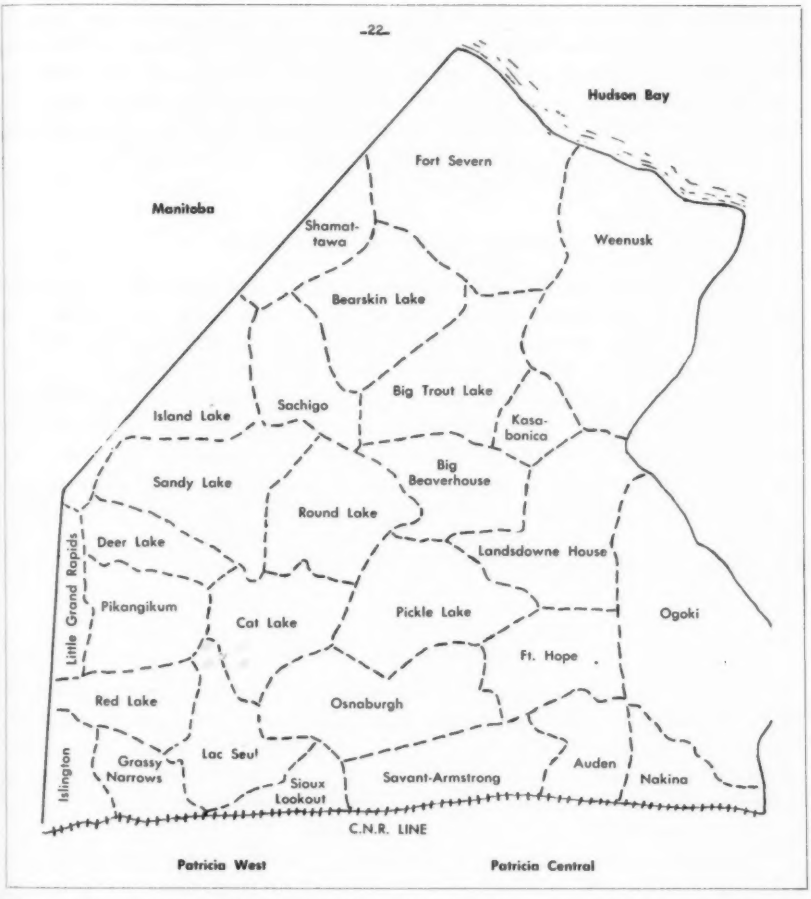

Fig. 2. Trapping areas of Indian bands residing in the central and western portions of the District of Patricia, northern Ontario. (From a map courtesy of Ontario Department of Lands and Forests).

Species of geese[1]

Three species and subspecies of geese make up over 99 per cent of the goose kill in the region: Blue and Lesser Snow Geese *(Anser caerulescens caerulescens)* which nest on Baffin and Southampton Islands and at Eskimo Point, District of Keewatin; Canada Geese *(Branta canadensis interior)* of four different flyway populations which have more or less

[1]For the present, the writers prefer to follow the nomenclature of Delacour (1954) which was also used in an earlier paper (Hanson, Queneau, and Scott, 1956) than that of the recent American Ornithologists' Checklist (1957).

contiguous nesting ranges around the bays (Fig. 3) (Hanson and Smith, 1950); and Richardson's Geese *(Branta canadensis hutchinsii)* which nest along coastal areas of Baffin and Southampton Islands and the adjacent mainland. Except for possibly a few individuals, the population of approximately 3,000 Brant *(Branta bernicla hrota)* which visits islands in James Bay closed to hunting (Stirrett, 1954) does not enter into the kill.

Previous goose kill information

Accurate data on the kill of geese in the North have particular significance from the management standpoint because they can usually be related to specific flyway populations. Barnston (1862) was the first to present estimates of the spring and autumn goose kills (Blue and Lesser Snow Geese) for a large part of the coastal areas of Hudson and James bays. More recent estimates of the kills of this species have been made by Stirrett (1954) and Cooch *(in litt.* 1955). The kills of Canada Geese were first appraised between 1945-47 by Hanson and Smith (1950) and by Hanson and Griffith (1952). The surveys in 1954, 1955, and 1956 were made to determine the kills in light of the tremendous increase of Canada Geese observed in the Mississippi Flyway since 1946.

The meaning of the kill

The meaning of the kill of a particular wildlife food resource to the native populations of the North cannot be assessed only in terms of the number of animals taken or the pounds of food furnished. Although a summary of this type is required, a subjective appraisal of the relation of particular animals — in this instance wild geese — to the morale and general welfare of the natives should also be borne in mind.

What truth there may be in the assertions that the northern natives kill large numbers of nesting geese and take their eggs must be restricted to a few bands of Eskimos, principally on the east coast of Hudson Bay, possibly the Belcher Islands, and a few sectors of Alaska. The depredations of these natives are not regarded as serious and are generally limited to the environs of native encampments (Gillham, 1948, and personal communications; Spencer, *et al.*, 1951). Nevertheless, there may be special situations where a species should be given all the protection possible. For example, the Ross's Goose *(Anser rossii)* population, which breeds in the Perry River region, numbered only about 2,000 birds in 1949. The toll that the local Eskimos take of this species is believed to be small (Hanson, Queneau, and Scott, 1956), but positive steps should be taken to hold it to a minimum.

For the northern Indian, whose self-reliant mode of life has remained essentially unchanged for generations, the spring thaw and break-up of the rivers and lakes may be a time of adversity because of difficult travelling

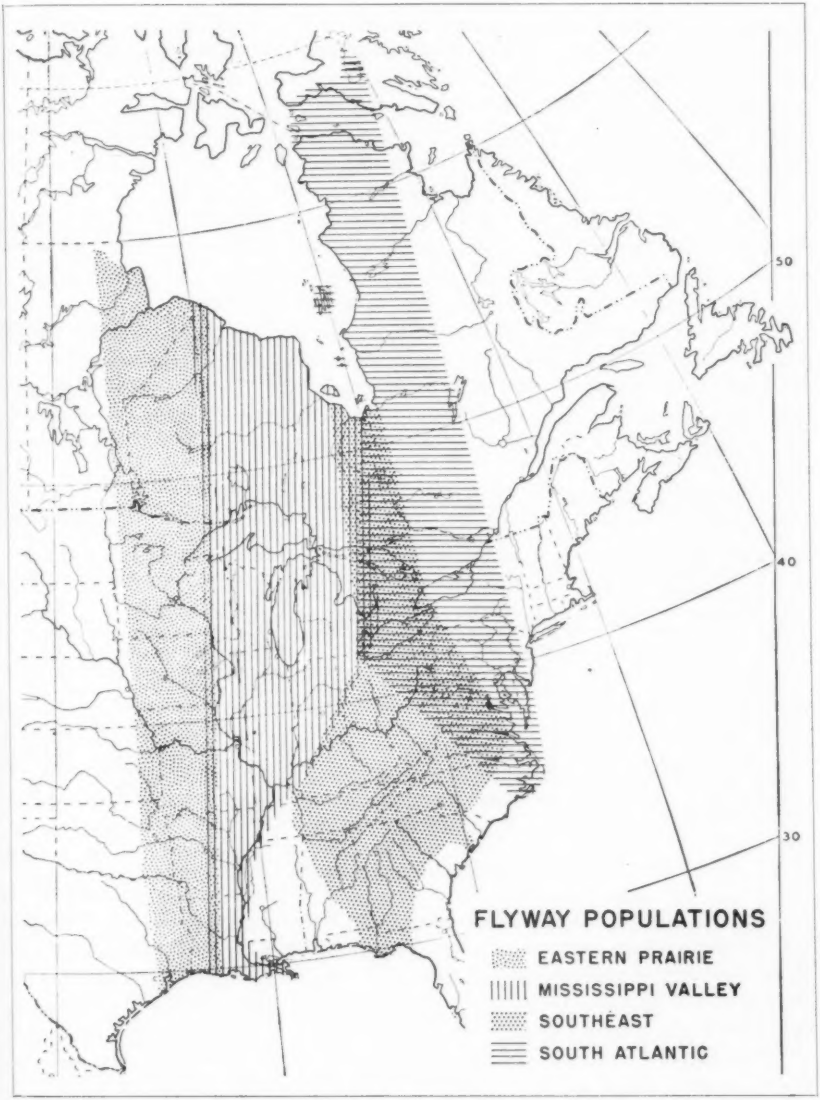

Fig. 3. The approximate ranges of four flyway populations of Canada Geese nesting in the Hudson-James Bay area. (From Hanson and Smith, 1950).

and hunting conditions. In the Hudson-James Bay region the return of Canada Geese and other waterfowl may mean a reprieve from a starvation diet, especially in years when staple food animals have undergone a cyclic decline in numbers. After months of dependence on fish and the flesh of

furbearers, geese and other waterfowl afford a change from a monotonous diet, and possibly have unrealized nutritional values. The by-products from waterfowl, such as feathers for bedding, are also important and should not be overlooked. Thus, it is understandable that in autumn the hunts along the coasts for Blue and Snow Geese take precedence over all other activities (Fig. 4). Many of the geese shot at this time are smoked and dried or salted down for use during the winter (Fig. 5).

Similarly the Eskimos on the east coast of Hudson Bay profit when Canada Geese are available. When the conditions of the sea ice in summer create a period of adverse hunting, they turn inland for food where they make important kills of moulting, flightless Canada Geese.

One of the late Bishop Robert J. Renison's (1944, p. 105) recollections of his early days at Fort Albany is a vignette of the electrifying effect on the Indians of the return of the geese from the South. A funeral service had just been held at the small church and the mourners, cold, sick, discouraged, and hungry after a long winter, were moving on snowshoes toward the cemetery.

> The Missionary walked in front, treading warily among the tents where husky dogs prowled, on his way to the little grave yard where two men with pickaxes had been for hours chipping the frozen earth deep enough to make a shallow trench. Although in the morning the whole scene looked and felt like the ragged end of winter, now the South wind grows warmer every moment and already the haze is seen in quivering waves over the melting ice and snow.
>
> As the cortege was lost in the maze of wigwams, suddenly the cry of wild geese was heard. The funeral procession stood still and from all over the settlement came the answering call from every living soul. A great flock of Canada grey geese swept like a gigantic airplane over the trees rejoicing at what seemed a welcoming call. The phalanx turned to leeward and sailed slowly down over the spot from which the sounds came. It was too much even for sorrow and decorum. The Chief Mourner dived into his tent and appeared in a moment with his loaded gun. With incredible ease and grace he brought down a goose with each barrel. Cheers and laughter rang out. The oldest instinct of man triumphed in every simple heart and as the pallbearers patted the bereaved husband on the back, he modestly replied like a true sportsman, "She did it. I always had luck when she was with me." Then the spell was broken; the procession resumed its direction.

Seasons of goose kills

Approximately 4,600 Indians and 1,200 Eskimos reside in the trapping and hunting areas adjacent to the coasts of the bays between Churchill, Manitoba, and Wolstenholme, Quebec (Table 1). The differences in conditions of life of these people and in the terrain over which they hunt are reflected in the seasons during which the natives make their kills of geese.

The kill of Canada Geese by the Indians residing on the western side of the bays takes place about the time of break-up, which occurs from the last week in April to mid-May or late May. Indians who hunt and trap on the muskeg breeding grounds adjacent to this section of the bays normally take from 80 to 85 per cent of their annual kill in spring: Indians residing in band areas which the geese visit only during migration, that is, those areas lying south of the Fort Severn and Weenusk area (Fig. 2), take from 68 to 87 per cent of their annual kill in spring, depending on the speed of the break-up. If the break-up is rapid, the majority of the migrating flocks

Table 1. Indian and Eskimo populations in the hunting and trapping areas adjacent to the coasts of Hudson-James Bay areas as of 1954 and 1951 respectively.

Indian band[1]	Total	Males 16-65	Eskimo band	Total	Males 16-65
Churchill	225	63	Great Whale	142	39
York Factory	211	43	Belcher Islands	165	42
Fort Severn	147	49	Richmond Gulf	49	16
Weenusk	143	47	Port Harrison	475	134
Attawapiskat	726	201	Povungnituk	170	47
Fort Albany	722	200	Cape Smith	127	36
Moose Factory	570	153	Wolstenholme	103	35
Rupert House	535	146			
Old Factory	319	87			
East Main	175	58			
Fort George	784	222			
Total	**4,557**	**513**		**1,231**	**349**

[1]These figures are high for some Indian posts as many families, although they continue to be registered under their original band, have moved elsewhere for employment.

pass overhead; if it is prolonged by cold and snowstorms, the flocks fly lower and make more frequent stops, thus becoming more vulnerable to the hunters.

Band recoveries demonstrate a seasonal similarity in the kill of Canada Geese by the Indians who hunt in the areas inland from the *eastern* coast of James Bay: about 78 per cent of their annual kill is made in the spring (Hanson and Griffith, 1952). Very few geese are taken by the Indians during the summer. The relative inaccessibility of the muskeg breeding grounds at this time would seldom make the energy expended in seeking out nesting pairs commensurate with the effort. Other types of hunting, fishing, and work about the posts usually prove to be more gainful activities.

In contrast to the Indians who make most of their kills of geese during the migration periods, the Eskimos residing along the eastern coasts of Hudson Bay obtain the largest number of Canada Geese during the summer. According to band recoveries, 64 per cent of the annual kill by these Eskimos is made during July and August, only about 11 per cent in May and June, and about 25 per cent in September and early October. Because of the absence of sea ice during the summer, these Eskimos must turn inland for a source of food. Their kill of Canada Geese at this time consists chiefly of moulting geese which are chased down on foot (Hanson and Griffith, 1952).

Richardson's Geese are shot in significant numbers by native hunters mainly in the coastal area near York Factory (Hanson, 1947; Nicholl, 1955) The Indians at this post informed the senior author in 1947 that they preferred to eat Richardson's Geese rather than Canada Geese in the fall because the former are fat when they arrive on the coast in September, whereas the resident Canada Geese are thin at that time, presumably only beginning to fatten in preparation for their fall migration.

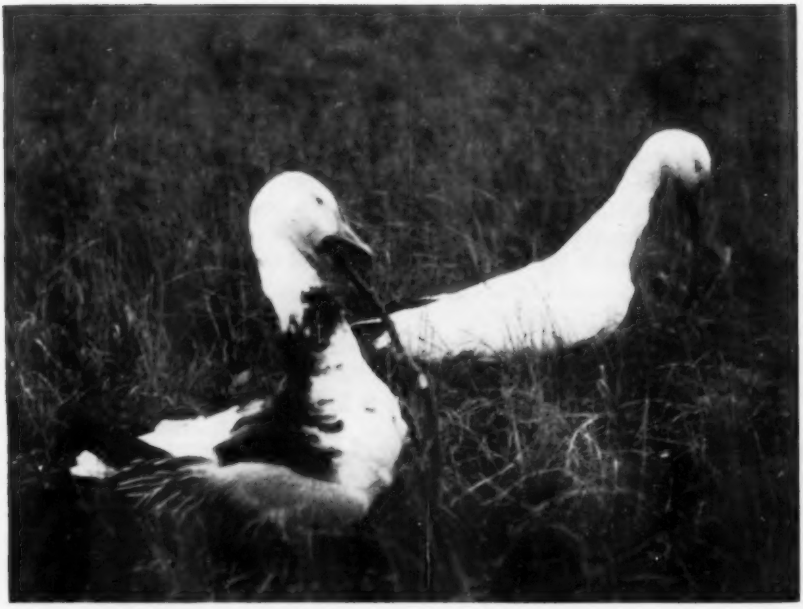

Fig. 4. Dead "waveys" propped up with a stick to serve as decoys. The goose on the left shows characteristics of both Blue and Snow colour phases. The goose on the right is a typical Lesser Snow Goose.

The kill of Snow and Blue Geese ("waveys"[1]) occurs along the coasts, particularly in the marshes along the southern and western coast of Hudson and James bays. The more rapid migration of these geese in spring and the presence of the Indian hunters on their inland trapping grounds at this time combine to make the spring kill of "waveys" smaller than the autumn kill. Our kill data from Fort Severn and Weenusk indicate that the spring kill of Blue and Snow Geese on the southern coast of Hudson Bay constitutes only about 6 per cent of the total annual kill of this species, while along the western coast of James Bay, at Attawapiskat, Fort Albany, and Moosonee, the kills of Snow Geese in the spring of 1956 were 36, 34, and 22 per cent, respectively, of the combined autumn 1955 and spring 1956 kills in these areas. At Attawapiskat the kill of "waveys" in the spring of 1948 was only 7 per cent of the total of the combined autumn 1947 and spring 1948 kills (report by John J. Honigmann to Indian Affairs Branch, Department of Citizenship and Immigration). According to Cooch (1956), band recoveries for the entire Hudson-James Bay region indicate that the spring kill is normally about 10 per cent of the total annual kill.

[1]Both Blue and Lesser Snow Geese are called "wavy" or "wavey" which are the English equivalents of "Wā-Wā", the name used by the natives of the interior of the District of Patricia. On the coast they are called "Whăho".

Fig. 5. Drying "waveys" as Snow Geese are called by the Indians. Such geese are utilized during the winter.

Size of goose kills

Blue and Lesser Snow Geese

Blue and Snow Geese, considered by some ornithologists to be colour phases of the same subspecies, comprise the major portion of the total goose kill by the natives of the trapping areas adjacent to Hudson and James bays. Barnston's (1862) early estimates of the annual kills for both the eastern and western coasts of the bays totaled 74,000. More recently Stirrett (1954) has placed the total annual kill at approximately 75,000 for the years 1948-53. This latter figure was based on an estimated average of nearly 100 geese per hunter for the 800 hunters residing in areas adjacent to the bays. It is difficult to fully appraise the validity of Barnston's estimate for earlier times, but the figure suggested by Stirrett (1954) for recent years is probably considerably above the upper limit of the normal range. However, conditions of native life in the North are rapidly changing in some areas with the increasing number of natives now being employed by the wood-pulp and mining industries, and on government projects. Even if not removed from their home trading post area, these Indians do relatively little hunting. The result is that a kill carefully determined for one year may not always serve as a reliable estimate for the following year. Moreover, band recoveries for only one of two years may not be an

accurate guide to the relative size of the kill in various areas as the distribution of the Blue and Snow Geese along the Hudson Bay coast may vary from year to year. For example, in the fall of 1955 Blue and Snow Geese were scarce at York Factory and were unusually numerous at Fort Severn and Weenusk.

In 1947, 20 Indians at York Factory reported killing 300 "waveys", which is an average of 15 per hunter (Hanson, 1947). Nicholl (1955) presented figures showing that Blue and Snow Geese comprised 87 per cent of the total kill of all geese in the York Factory area in the fall of 1954, and indicated a total kill of about 1,000 birds, or 22 per hunter. Cooch (personal communication, 1955) estimated the annual kills at Fort Severn and Weenusk in 1954 to be approximately 1,500 birds per settlement. Father J. Bte. Gagnon, O.M.I., of Weenusk placed the average total "wavey" kill by the Indians of that post at 1,000 in 1947 (Hanson, 1947). Father Leopold Morin, O.M.I., estimated the annual kills in the Fort Severn region at 3,000 in 1955. These estimates by informed observers imply an average kill of from 40 to 80 "waveys" per hunter at Fort Severn, and from 24 to 37 per hunter at Weenusk.

Dr. John J. Honigmann (1944), anthropologist in residence at Attawapiskat in 1947-8, placed the fall kill there at 5,840 and the spring kill at 440, which was a total of 6,280 for this post. A few Indians shoot as many as 300-400; others, who must leave the coastal posts for their distant inland trapping grounds before the Blue and Snow Geese arrive, kill none. Similar circumstances are true for the Fort Albany natives. Their kill of Blue and Snow Geese in 1946-7 was estimated to be about 4,000 birds. Although the kill by some individuals may exceed 100, it is very doubtful if the average kill per hunter for the 100 hunters of the Fort Albany band exceeded that of the Attawapiskat hunters.

Fortunately, recent and more detailed data for these latter posts and for Moosonee are now at hand. The combined autumn 1955 and spring 1956 kills of "waveys" by 80 trappers at Attawapiskat, 115 trappers at Fort Albany, and 47 trappers at Moosonee averaged 74.7, 57.9, and 15.6 birds per hunter and the total calculated kills per band area were 5,974, 6,653, and 2,110, respectively. This was a total of 14,737 for the western coast of James Bay.

Barnston's (1862) combined estimate for the kill at Fort Severn and Weenusk was 10,000. His estimated kill of 30,000 "waveys" by the Fort Albany Indians may possibly include that of the Attawapiskat Indians as the latter are not listed by him. His figures may seem high, but in earlier times "waveys" were a year-round staple food item and an object of trade. Thousands were salted down in barrels annually and shipped to other posts.

From the data at hand it would appear that the annual fall kill of Blue and Lesser Snow Geese on the western coast of Hudson and James bays from York Factory to Fort Albany in recent years is in the neighbourhood of 20,000. Excellent "wavey" shooting is afforded the Indians who hunt in the marshes around the southern end of James Bay in autumn, but,

in the opinion of observers familiar with this area, the average kill per Indian would not exceed that made by the Indians of more northerly groups.

There are few reliable data for the kills of "waveys" on the eastern side of Hudson and James bays, but the lack of extensive coastal marshes there make it very unlikely that the total kill of "waveys" by the Eskimo[1] and Indian[2] hunters of the region approaches the kill made on the southern and western coasts. The restoration of beaver in the Rupert House area and subsequent trapping reduced the goose kill in that area. Prior to 1940, the Indians of the Rupert Bay area shot 1,500 to 2,000 geese in the fall, most of which were "waveys". Ten hunters there in the fall of 1943 shot 243 "waveys" but this was considered a poor hunt due to the fine weather that year (Watt, 1943). The present data, admittedly incomplete, suggest that the total "wavey" kill for all of the Hudson-James Bay region probably does not usually exceed 35,000 to 40,000 birds.

Canada Geese

To evaluate losses of Canada Geese in the Hudson-James Bay region from hunting, the kills must be related to the various flyway populations.

The Eastern Prairie Flyway population. The muskeg country of the York Factory area lies in the eastern portion of the breeding grounds of the Eastern Prairie Flyway population (Hanson and Smith, 1950). This sector of the Hudson Bay lowlands is relatively dry and contains few lakes; consequently it is much less productive of Canada Geese than the lake country south of Churchill.

Twelve hunters interviewed by Hanson in 1947 reported shooting an average of 3 Canada Geese in the fall of 1946 and an average of 4 in the spring of 1947. The largest number of geese shot by one Indian was 12; several hunters shot none. Nicholl (1955), in his study of goose kills in the York Factory area in 1954, found that Canada Geese comprised about 11 per cent of the fall kill of all species. His data indicate an average of about 2.8 Canada Geese shot per hunter. In the spring of 1955 the 45 trappers at York Factory shot an average of 13 geese, but data on the species of geese comprising this kill are not available.

The kill of Canada Geese by Indian bands is negligible (Table 2) in areas which lie to the south of the eastern portions of the breeding grounds of the Eastern Prairie Flyway population and west of longitude 90°, that is, the areas west of the main range of the Mississippi Flyway population (Fig. 3). The Indians of these areas reported that they see few Canada Geese in migration, and those that are observed usually pass overhead at high elevation, seldom alighting. This scarcity of migrating flocks, in addition to the few recoveries of banded geese, is considered evidence that the main pathway of migration of the Eastern Prairie Flyway population — which farther south migrates through central Missouri — is farther west in Manitoba.

[1]349 Eskimos 16-65 years of age, 1951 census (total active hunters somewhat less).
[2]576 Indians 16-65 years of age, 1954 census (total active hunters somewhat less).

Table 2. Number of Indian trappers and number of Canada Geese killed per trapper and total calculated kill in some Indian band trapping areas within the range of the Eastern Prairie Flyway Canada Goose population in western Ontario and eastern Manitoba, 1954-55.

Band area	Number trappers In band 1955	1956	Per cent interviewed 1955	1956	Average annual kill per trapper 1955	1956	Total calculated kill by band 1955	1956
Within breeding grounds								
York Factory[1]	45		(100.0)		7-12		428	(540)
Shamattawa[2]	41		(100.0)		1-3		100	(125)
Sub-total	**86**		—		—		**528**	**665**
South of breeding grounds[3] (In Ontario)								
Red Sucker Lake	21	—	57	0	0.5	—	11	(55)
Island Lake	81	72	47	100	0.1	0.4	8	29
Sandy Lake	94	66	39	64	0.03	3.5	3	329
Deer Lake, Ont.	31	33	68	33	0.2	1.3	6	43
Little Grand Rapids	31	32	26	0	0.0	—	0	(5)
Pikangikum	92	97	64	87	0.1	0.5	9	49
Sub-total	**350**						**37**	**510**
Total	**436**						**565**	**1,175**

[1]Estimates based on data from Nicholl (1955) and Hanson (1947, unpublished).
[2]Estimates based on data from Nicholl (1955) and from interviews with 14 trappers in 1954 and 11 trappers in 1955 made by the authors.
[3]Data refer only to portions of the band areas lying within Ontario.

The Mississippi Flyway population. Our data are most complete for the Canada Geese of the Mississippi Flyway. This population breeds in the muskeg country of northern Ontario from about the Lawabiskau River which flows into the southwestern portion of James Bay northward and westward to a point roughly mid-way between Fort Severn, Ontario, and York Factory, Manitoba (Fig. 3). It winters chiefly in Minnesota, Wisconsin, Michigan, eastern Iowa, Illinois, Indiana, Ohio, eastern Missouri, western Kentucky, and Tennessee. A small segment of this population, possibly a total of a few thousand birds, may winter in areas adjacent to the Mississippi River south of the Tennessee state line.

In 1944 and again in 1946 and 1947 an effort was made to ascertain the kill of these geese by the Indians in western Ontario (Table 3). From data gathered by personal interviews with Indian hunters on the breeding grounds, and by estimation from band recoveries for the remainder of the Ontario range, it was calculated that the total kill was approximately 5,500 in 1944, 3,900 in 1946, and 4,700 in 1947. These totals amounted to 8-10 per cent of the northward bound flights in those years (Hanson and Smith, 1950). Studies in 1954-56 revealed that sizeable kills of geese are made in trapping areas of Indian bands living south of the breeding grounds which had not been personally investigated. The 1947 figure, used in Table 4 for comparison with more recent data, is adjusted to about 6,300. This total is equal to about 11.4 per cent of the 1946-7 wintering population. While a number of Indians at each post who are not licensed trappers hunt geese, we believe that the recorded number of licensed trappers furnishes the best basis at the present time on which to estimate the total kills.

Table 3. Number of active Indian trappers that resided within the approximate range in Ontario of the Canada Geese of the Mississippi Flyway, 1947-56.

Indian band trapping areas	Number in band				Per cent interviewed			
	1946-47[1]	1954[2]	1955[2]	1956[2]	1947	1954	1955	1956
Within breeding grounds								
Fort Severn	47	37	36	34	55	100	72	100
Weenusk	33	41	35	19	94	54	46	100
Attawapiskat	134	63	65	80	21	0	0	100
Sutton Lake	4	5	5	5	0	100	0	100
Fort Albany	100	98	85	115	67	0	42	100
Ogoki	16	34	30	30	100	0	0	37
Sub-total	**334**	**278**	**256**	**283**				
South and west of breeding grounds	**(1948-9)[2]**							
TIER I								
Kasabonica	29	33	34	36	0	70	79	83
Landsdowne House	98	106	106	107	0	73	70	68
Fort Hope	24	29	28	27	0	79	89	70
Auden	35	23	23	20	0	0	44	30
TIER II								
Bearskin Lake	47	44	44	37	0	80	100	100
Big Trout Lake	77	79	82	63	0	76	55	100
Big Beaver House	46	52	49	44	0	79	86	91
Pickle Lake	63	65	70	60	0	49	46	66
Osnaburgh	86	81	78	75	0	85	33	53
Savant-Armstrong	74	70	70	71	0	0	41	0
TIER III								
Sachigo Lake	47	46	47	41	0	30	40	73
Round Lake	40	57	57	51	0	63	84	69
Cat Lake	34	32	32	33	0	0	53	82
Lac Seul	119	130	127	75	0	0	0	0
Sub-total	**819**	**842**	**847**	**740**				
Total	**1,152**	**1,120**	**1,103**	**1,023**				

[1]Data from Hanson and Smith (1950).
[2]Number of licensed trappers.

By 1954 this flyway population had increased to about 192,000. In 1955 the January inventory revealed that there were about 225,000 on the wintering grounds, and in 1956 the population had risen to about 240,000. Thus, over a nine-year period the population had increased by 335 per cent and, in light of this, it was desirable to attempt to determine to what extent the Indians had benefitted.

Complete data for the breeding grounds that lie within the trapping grounds of the Fort Albany and Attawapiskat Indians are not available. Hence the 1953-4 data for these areas were compiled on the basis of the per cent of change in the kills made by the Fort Severn and Weenusk Indians between 1947 and 1954. The average kill by the Indians of Fort Severn and Weenusk in the spring of 1947 was 19.0 and 15.6 geese, respectively, per trapper, but the total kills for these areas when combined showed no significant variations from the 1947 and 1954 kills (Table 4).

Recoveries of banded geese have indicated that the eastern to western range of the Mississippi Flyway geese in Ontario can be satisfactorily described as including that sector of the province lying between 80° and 92° longitude (Fig. 3). Basing our calculations on kill data (Table 4) for

Table 4. Number of Canada Geese killed per Indian hunter and total calculated kills in various band trapping areas within the approximate range in Ontario of the Mississippi Flyway Canada Goose population 1945-56.

	Average kill per hunter						Average annual kill per hunter[1]					Calculated annual kill per band area[6]				
	Fall 1953	Spring 1954	Fall 1954	Spring 1955	Fall 1955	Spring 1956	1945-6	1946-7[2]	1953-4	1954-5	1955-6	1945-6	1946-7	1953-4	1954-5	1955-6
Within breeding grounds																
Fort Severn	3.6	15.9	2.4	14.8	3.5	13.4	14.0	17.0	19.5	17.2	16.9	658	790	722	619	608
Weenusk	5.0	21.8	4.2	19.6	2.1	9.0	15.0	19.0	26.8	23.8	11.0	495	627	1161	833	385[4]
Sutton Lake	28.0	22.0	—	—	—	—	(30)	(30)	50.0	(45)	(40)	(120)	(120)	250	(225)	(200)
Attawapiskat	—	—	—	—	2.8	18.0	13.3	15.6	—	(15)	20.8	1782	2090	(1170)	975	1663
Fort Albany	—	—	0.4	13.8	1.6	10.6	9.5	11.1	—	14.2	10.6	950	1110	(1030)	1207	1402
Ogoki	—	—	—	—	0.0	16.1	3.0	3.6	—	(10)	16.1	48	56	(350)	300	483
Sub-total or average[3]	**5.6**	**18.9**	**1.5**	**15.0**	**2.2**	**13.0**	**13.1**	**13.1**	**24.7**	**16.5**	**15.2**	**4053**	**4793**	**5449**	**4159**	**4741**
South and west of breeding grounds																
TIER I																
Kasabonica	2.1	3.6	0.6	2.7	0.8	3.5	—	—	5.7	3.1	4.3	—	—	188	105	146
Landsdowne House	1.2	4.3	1.7	2.2	1.2	4.8	—	—	5.5	3.9	6.2	—	—	583	413	657
Fort Hope	0.3	5.3	0.2	0.7	0.1	6.3	—	—	5.6	0.9	6.4	—	—	163	25	179
Auden	—	—	0.0	1.7	1.2	8.7	—	—	(5.6)	1.3	9.8	—	—	(129)	30	225
Sub-total or average	**1.2**	**4.4**	**1.1**	**2.0**	**1.1**	**4.9**	—	—	**5.6**	**3.0**	**6.0**	—	—	**1063**	**573**	**1207**
TIER II																
Bearskin Lake	—	1.0	0.7	1.0	0.9	3.2	—	—	—	—	—	—	—	44	75	180
Big Trout Lake	—	1.7	1.1	1.8	0.6	3.5	—	—	1.7	2.9	4.1	—	—	134	238	258
Big Beaver House	0.0	1.4	0.1	0.3	0.6	2.7	—	—	1.4	0.4	3.3	—	—	73	20	162
Pickle Lake	0.0	3.8	0.5	0.4	0.2	4.5	—	—	3.8	0.9	4.7	—	—	247	63	329
Osnaburgh	0.0	2.4	0.0	0.3	0.6	2.3	—	—	2.4	0.3	2.8	—	—	224	23	218
Savant Lake	—	—	—	—	3.0	21.2	—	—	(2.3)	0.6	24.0	—	—	(196)	42	208
Sub-total or average	**0.0**	**2.1**	**0.5**	**0.8**	**0.6**	**3.6**	—	—	**2.1**	**1.4**	**4.3**	—	—	**918**	**461**	**1355**
TIER III																
Sachigo Lake	0.0	2.0	0.2	0.7	0.2	2.4	—	—	2.0	0.9	2.6	—	—	92	42	122
Round Lake	—	1.7	—	—	0.0	0.7	—	—	1.7	0.3	0.7	—	—	97	17	40
Cat Lake	—	—	—	—	0.3	1.9	—	—	(2.0)	0.2	2.3	—	—	(64)	6	74
Lac Seul	—	—	—	—	—	—	—	—	(1.8)	(0.3)	(2.0)	—	—	(234)	(38)	(150)
Sub-total or average	**0.0**	**1.8**	**0.2**	**0.7**	**0.2**	**1.6**	—	—	**1.8**	**0.4**	**1.8**	—	—	**487**	**103**	**386**
Remainder of Ontario[5]												**(1500)**	**(1500)**	**1000**	**660**	**1200**
Total annual kill												**5553**	**6293**	**8917**	**5956**	**8889**

[1]Data in brackets are estimates based on data for the same band area in other years or from data on the average kills in other band areas in the tier for that year. They are not included in sub-total calculations of average kill. This procedure was often necessary to arrive at a reasonable estimate of annual kill per band area.
[2]From Hanson and Smith (1950).
[3]Some of these figures are not strictly comparable because of incomplete data.
[4]Low figure is due to the smaller number of Indians that were engaged in trapping and hunting during the 1955-6 season.
[5]These figures represent only a rough estimate.
[6]Kill figures recently compiled for 1956-7 are as follows: Fort Severn, 849; Sutton Lake, 54; Attawapiskat, 1,782; and Fort Albany, 1,384.

the above sector, and making allowance for the areas south of the Canadian National Railway which were not investigated, it is estimated that the total kill by the Indians in the fall of 1953 and the spring of 1954 was approximately 8,900 birds. In 1954-5 the total kill was calculated to be about 6,000; in 1955-6, about 8,900. These kills were roughly 4.6, 2.6, and 3.7 per cent of the respective annual flyway populations. However, these and other losses should be added to flyway inventory figures as a part of the annual populations and the kill calculated as a percentage of the combined total for a more accurate appraisal of the Indian kill in relation to other mortality factors. This procedure would reduce the above percentages, but inclusion of an estimate for crippling would partially offset this reduction. For the purposes of this paper the calculation of the kill as a percentage of the birds assumed to have reached the North and to have been *available* to the natives (i.e., populations at January inventory) is considered sufficiently accurate.

From the above data it appears that the Indians' share of these geese not only did not increase in proportion to the increased goose population, but was reduced by about 65 per cent. Furthermore, the kill on the breeding grounds seems to be surprisingly stable in spite of greatly increased populations of geese. The only explanation to account for this at present is that the limited amount of *time* available to the Indians for hunting geese may be the main controlling factor. The critical period is limited to the time between the arrival of the geese shortly before break-up and the actual onset of break-up, an interval of two to three weeks. The largest kills by individual hunters are often made when early migrants are confined to small open areas in the rivers. When the break-up occurs, the breeding geese leave the rivers to seek nesting sites in the lake areas of the interior muskeg. In some areas of the breeding grounds these lake areas are close to the main rivers; in others, they lie several miles from the rivers. In either case the flocks become scattered and less available to hunters. Shortly after break-up the Indians leave their inland camp sites for the coastal posts.

The average spring kill per Indian in 1954 and 1956 as compared with those in 1955 for the regions lying *south* of the Fort Severn and Weenusk areas are strikingly dissimilar (Table 4). There are several reasons for this. In 1954 the spring was unusually late and the break-up period prolonged. Indians at both Landsdowne House and Fort Hope reported that the migrating flocks of Canada Geese were driven back south twice by late snowstorms and low temperatures before attaining their breeding grounds. A portion of the population, particularly the early migrants, possibly made as many as five flights that spring along their main migration route, thereby providing these Indians with several times their normal goose hunting opportunities. In 1955 the spring break-up was early and occurred with unusual rapidity; all of northern Ontario opened up at about the same time. As a result, most of the migrating flocks passed rapidly over the band areas south of the breeding grounds without stopping and

thus afforded little opportunity for shooting. In 1956 the break-up was late again, resulting in another increased goose kill.

In Table 4, the kill data for the various band trapping areas indicate that the heaviest flights of northward-bound geese (exclusive of those over the actual breeding grounds) pass over the Fort Hope, Landsdowne, and Kasabanica band areas; west of these areas the frequency of migrating flocks gradually decreases. The relative scarcity of migrating flocks passing over the band trapping areas of Patricia West and adjacent areas in eastern Manitoba was further confirmed by interviews with natives of these areas in September 1954. The Fort Hope-Kasabanica flight route, which extends directly northward, apparently is used by the bulk of the geese that nest in the large breeding grounds south of Weenusk — perhaps one of the most important production centers of the Canada Geese of the Mississippi Flyway.

The South Atlantic Flyway population. Our scanty knowledge of kills of Canada Geese on the east side of Hudson and James bays, the breeding grounds of this population, has been summarized by Hanson and Griffith (1950). According to informed local observers the total kill by the 181 Eskimo hunters in the Povungnituk-Port Harrison area in the north Hudson Bay sector of the breeding range may be as high as 3,000 birds. The Rupert House Indians, as expected from band recoveries, kill few Canada Geese. Father Damase Couture reported (Hanson, 1946, unpublished) that 30 Canada Geese were the largest single kill in 1946, and that normally a kill of 10 was unusual. He stated that the kill in autumn is about nil. Studies by Mr. A. J. Kerr, who was a resident anthropologist at Rupert House in 1947, revealed a kill of 420 Canada Geese by 111 Indian hunters, or an average of 3.8 geese per hunter (Hanson and Griffith, 1952).

The kill in the intervening region is a matter of conjecture. In the James Bay sector the kill of Canada Geese is said to take place mostly north of Old Factory River. Fort George, with a large Indian population, is a major hiatus in our data (Tables 1 and 5). Band recoveries from Canada Geese banded at the Jack Miner Migratory Wildfowl Sanctuary near Kingsville, Ontario, shed some light on the relative size of the kill in different areas (Table 5). Seventy per cent of the recoveries are from the Hudson Bay sector and only 27 per cent are from the James Bay sector. Fifty-two per cent of all the recoveries were made in the area extending from the Kikkerteluk River north to Povungnituk Bay. The Eskimos who traded at the posts of Port Harrison and Povungnituk hunt this region of Hudson Bay. Assuming that the estimated kill of 3,000 geese by these natives is valid (it may be high), it would appear from band recoveries that the total kill for the entire east coast of the two bays is in the neighbourhood of 6,000 birds. This estimate necessarily rests on another assumption — that the efficiency of reporting band recoveries from the Indians of the James Bay sector and the Eskimos of the Hudson Bay sector has been approximately equal. A calculated kill of 6,000 does not appear to be an

Table 5. Number of recoveries of Canada Geese banded at the Jack Miner Migratory Wildfowl Sanctuary, Kingsville, Ontario, 1925-44, and received from various areas of the east coasts of Hudson and James bays.

Area	Number of recoveries		Total number recovered	Per cent of total
	Banded in spring	Banded in fall		
James Bay				
Rupert House	5	0	5	less .1
East Main	71	4	75	10.8
Old Factory	19	4	23	3.3
Fort George	70	21	91	13.1
Sub-total	**165**	**29**	**194**	**27.2**
Hudson Bay				
Cape Jones to Nastapoka Sound, including the Belcher Islands	101	26	127	18.2
Kikkerteluk River to Povungnituk Bay	233	126	359	51.6
Cape Dufferin	1	6	7	less .1
Cape Smith	6	2	8	less .1
Sub-total	**341**	**160**	**501**	**69.8**
Total	**506**	**189**	**695**	**100.0**

unreasonable one; in terms of average kill per potential hunter (men from 16 to 65 years of age), it amounts to only 8.6 geese per Eskimo and 6.0 geese per Indian.

Richardson's Goose

This small subspecies of the Canada Goose is shot in appreciable numbers in the Hudson Bay area only in the vicinity of York Factory, Manitoba. In 1947, 16 Indian hunters at York Factory reported to the senior author that they killed 332 Richardson's Geese, or about 21 birds per hunter, in the fall of 1946; in the spring of 1947 they killed about 256, or an average of 16 per hunter. The *Census of Indians in Canada* for 1949 indicates that there were about 40 prospective hunters in the band, that is, men in the age bracket of 16-65. The total calculated kills from these data amount to 840 and 640, respectively. Even when we assume a large margin of error, a total kill of only about 30 Richardson's Geese by these Indians in the fall of 1954 (as derived from data reported by Mr. T. Nicholl (1955)) is startingly small. Perhaps a partial explanation of the small 1954 kill lies in Mr. Nicholl's statement that, as a result of strong west and northwest winds that fall, the migrating flocks arrived at the coast of Hudson Bay east of Cape Tatman, which is beyond the usual fall goose hunting range of the York Factory Indians. The primary reason for a reduced kill in 1954 may have been due to a smaller population of Richardson's Geese that year as evidenced by a sharp decline in the numbers which have migrated in spring through the Sand Lake National Wildlife Refuge, South Dakota, since 1952 (Harvey K. Nelson, *in litt.* July 31, 1957). This decline is presumably associated at least in part with the relatively heavy kills of this species that have taken place in South Dakota in recent years.

Conclusions

Of the three kinds of geese considered here, the Blue and Snow Geese make the greatest contribution to the welfare of the natives. Kills made by Indians and Eskimos are such a small part of the total numbers of these geese (well under 5 per cent if related to the total Blue and Snow Goose population wintering in Louisiana and Texas) that they cannot be considered an important factor affecting population trends of the species. The Blue and Snow Geese which breed on Baffin and Southampton Islands are probably different management populations as they have different migration routes and wintering grounds (Manning, 1942; Cooch, 1955); hence it is desirable that eventually the kills of these geese in the various parts of Hudson and James bays be related to the proper wintering populations.

Recent increases in the numbers of Canada Geese in the Mississippi Flyway have been of some benefit to the Indians of northern Ontario, but the importance of the Indian kill of these geese relative to their numbers decreased between 1946-7 and 1954-56. The Indian kill, not considered a major mortality factor in controlling population levels in the 1940's, is now of even less consequence to over-all population trends of these Canada Geese.

The present investigation has indicated that the kills of geese made by the native hunters in the Hudson-James Bay region are within safe limits of what the nesting populations of that area can withstand. Fortunately, because of the adherance of wild geese to definite breeding grounds, migration routes, and wintering grounds, and the fact that they can be so readily censused, few waterfowl are so easily managed. Continuing improvement and expansion of the wintering grounds have done much to increase their numbers and guarantee their future. This fact, and the remote and generally inaccessible nature of their breeding grounds, offer assurance that wild geese will continue to be an important source of food for the northern natives.

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SOME PROBLEMS IN ENGINEERING GEOLOGY CAUSED BY PERMAFROST IN THE ARCTIC COASTAL PLAIN, NORTHERN ALASKA*

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DURING field studies of permafrost from 1945 to 1951[1], especially at a U.S. Navy camp near Barrow, Alaska, the writer was impressed with the controlling influence of permafrost on certain engineering projects. Permafrost has direct and indirect effects on transportation, surface and underground exploration, construction and durability of structures in or on permafrost, water supply, sewage disposal, and petroleum resources. Numerous reviews of the engineering aspects of permafrost are available (Liverovsky and Morosov, 1941; Muller, 1947; U.S. Army, 1950; University of Minnesota, 1950; Black, 1951; Tschebotarioff, 1951; Frost Effects Laboratory, 1952; Johnson, 1952; Terzaghi, 1952; Lovell and Herrin, 1953; Black, 1954; and Schultz and Cleaves, 1955), and no attempt is made herein to present another survey. Only some of those relationships of permafrost to engineering as particularly applicable to the Arctic Coastal Plain Province of northern Alaska are mentioned here. Some of these peculiar aspects are touched upon briefly merely to point them out, or to emphasize them, rather than to present solutions to the problems thereby arising. Some of the unique problems, including drilling, have been met and solved, at least in a limited way, during exploration of U.S. Petroleum Reserve No. 4 in northern Alaska by the U.S. Navy (Fagin, 1947; Wilson, 1949). Others have yet to be met given future projects with different purposes. Complete records have been kept by the Bureau of Yards and Docks, U.S. Navy, on engineering in petroleum exploration in northern Alaska, 1944-54, of which certain results are summarized in U.S. Navy (1948-1949a, b).

Most construction undertaken in areas of permafrost requires individual surveys to determine the most practical method. The Arctic Coastal Plain Province is no exception to that general rule. Because of its large cold reserve (the average minimum temperature is $-10°$ C, and the normal thickness of permafrost is about 1,000 feet), except under the major deep lakes, permafrost should be used as a construction "material" for economy of time and money in most instances. Scheduling of engineering projects must then take into account the time required to thaw and refreeze permafrost in emplacement of foundations. To ignore permafrost in construction is to invite delays, expensive repairs, or later failures.

Nees and Johnson (1951) have reviewed some of the problems in engineering exploration in the Arctic. Such problems generally involve

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logistics more than the direct effects of permafrost, except in extensive subsurface explorations.

Overland transportation

Roads are absent in northern Alaska except for those within the confines of the Navy camp near Barrow and at Umiat, about 175 miles southeast of Barrow. The gravel and sand beach 4 miles long between the Navy camp and Barrow village is used as a road by wheeled vehicles, without improvement except for intermittent grading. Therefore, essentially all overland traffic must follow natural terrain, and tracked vehicles, (or large-tired "swamp buggies" or similar vehicles) are required for year-round transportation. In summer, amphibious vehicles are used to cross the numerous lakes, streams, and marshes resulting from poor subsurface drainage caused by permafrost at shallow depth. Such vehicles can avoid circuitous routes by fording or barging. Cut-banks constitute natural obstacles, many of which must be circumvented. The ridged and furrowed surface of the coastal tundra, caused largely by growth and thaw of ice wedges in permafrost, results in slow and indirect overland movements. For men and light loads, tracked vehicles, such as the Weasel (M29c) and Canadian snowmobile, with ground pressures of less than 2 pounds per square inch, ride over the turf without breaking it, except after many passes. Once the turf is broken, vehicles sink deeper into the supersaturated material, and travel is generally slower. The heavier vehicles, tractors, tanks, and LVT's have much greater ground pressure and commonly cut through the turf and ride on top of permafrost. For these vehicles, angle-dozing may be necessary, especially if sleds are being pulled, to avoid "high-centering" by the vegetal mat that bunches up in front of and under them. Permafrost is of less importance in a sand dune area 30 to 60 miles southeast of Barrow, where the well-drained, thick, active layer supports tractors and sleds well, and ice wedges which are everywhere present, are not indicated at the surface by strong relief.

In winter, low temperatures, drifting snow, darkness, and lack of natural landmarks are the chief obstacles to overland travel, but movement over the snow is faster and easier than over bare ground in summer. Permafrost is not a problem. Movement of heavy equipment in winter is done largely by tractor trains (U.S. Navy, 1948-49a, b; Earle, 1949; and Jones, 1951).

In the Arctic Coastal Plain the fall "freeze-up" and spring "break-up" are the most critical seasons for overland transportation. During "freeze-up", the active layer in many places freezes to permafrost as much as a month later than in immediately adjacent areas, because of differences in moisture content and thickness of the active layer, topography, and thickness of snow cover. Marshes and the low, wet furrows over ice wedges are especially slow in freezing. During "freeze-up", the tracks of vehicles may break the thin frozen crust overlying water or supersaturated

fine-grained materials, immobilizing the vehicles which are then supported by ice between the tracks. During "break-up", streams are high and ice in the lakes is weakened by thaw so that vehicles break through easily.

Construction

Bench marks

Only with great difficulty and expense can bench marks be accurately placed for tide levelling or positioning within a millimeter or two in the Arctic Coastal Plain. Ice-wedge polygons are everywhere in the coastal plain, and measurements of ground contraction by Black (1952) indicate that individual polygons move erratically many millimeters during one year. Near-surface temperature surveys, examination of contraction cracks, and fabric studies of ice wedges also show that significant movements take place in permafrost to depths as great as 10 m. annually. Therefore, to insure that a bench mark will stay in place requires (1) the removal of the fine, supersaturated material to a depth of at least 10 m.; (2) back-filling of the excavation with material less subject to thermal changes; (3) permanent draining. Ideally, the bench mark should be a long rod placed inside a tube or cylinder penetrating perhaps 20 m. into the ground with at least the upper 10 m. of ground removed from within the tube, and the whole covered to prevent cold air effects at the base and to exclude foreign material. Thus, the upper 10 m. of the ground that is most subject to movement does not come in contact with the bench mark that is frozen-in below a depth of 10 m. According to the writer's contraction measurements, bench marks less than 10 m. in length, especially in or adjacent to ice wedges, are subject to lateral movements of 1 to 2 cm. and to vertical movements of perhaps 1 to 3 mm. per year. Such movements commonly are cumulative from year to year. Movement of this magnitude has been recorded by the U.S. Coast and Geodetic Survey personnel at their tide gauging stations (D. A. Jones, oral communication) and at their magnetic observatory at Barrow.

Excavations

Excavations or surface pits in the thawed active layer can be made in summer with normal excavating equipment. However, surface thaw commonly is only a few inches deep, seriously restricting the depths to which excavations can be made. Thawing of permafrost by solar radiation is most economical (Patty, 1951) but is effective only for about three months. By frequent removal of the thawed material in borrow pits, excavations to depths of several feet can be accomplished in one summer. Usually any surface excavation fills immediately with water, which must be drained or pumped. In winter, bulldozers, carryalls, and scrapers have essentially no effect on saturated, frozen, fine-grained material. It must be broken up with jack hammers or explosives, or thawed artificially.

Steam jetting is most effective for emplacement of piles and for thawing

of small, shallow surface pits, because the size of the thawed area can be controlled most easily. Cold running water (hot water is less economical) is suitable for hydraulic operations or sprays in summer, provided the drainage is good. Hand tools for excavations include the miner's pick and chisels, but they are very slow and labourious to use. Explosives can be used effectively to form shallow pits if a small hole is first drilled. This is done commonly to provide a mud sump for drilling operations.

Ice cellars are convenient and relatively cheap for cold storage in areas of permafrost and have been used by the Eskimos since prehistoric times. Various methods are used to make the excavation. The Eskimos and early miners built fires on the frozen ground or used heated stones to thaw a thin layer of ground that was then scraped off. Thawing by steam or water is much more rapid. The use of steam offers advantages because little water is added to the excavation. Jack hammers are especially effective in supersaturated materials that are below —5° C. Sledge hammers, drill rods, masonry chisels, pick mattocks sharpened to a blunt V-point, and other hand tools are also used. Machines similar to the chain tree saw or coal cutter can be adapted for use in fine-grained frozen ground. Explosives are also practical.

Foundations

Bedrock in the Arctic Coastal Plain lies, on the average, several tens of feet beneath the surface and is thus, too deep to be used as foundations for most structures. The unconsolidated surficial materials must be used,

Fig. 1. Excavation near Barrow for large tower foundations that will be "frozen-in" in permafrost consisting mostly of ground ice. Ducts provide heat to the setting concrete. July 15, 1947.

but they are not suitable for foundations unless permafrost is retained (Fig. 1). The fine clay, silt, and sand covering the surface of the Arctic Coastal Plain generally are supersaturated and flow like molasses when thawed. Because of the large cold reserve of the permafrost, which is about −10° C near the surface, it is not difficult to insulate buildings, oil well foundations (Rathjens, 1951), or large structures (Roberts and Cooke, 1950; Nees, 1951) so that heat conduction will not thaw the underlying permafrost. However, concrete foundations for heated buildings, boilers, pumps, or other structures cannot be laid on a few inches of gravel and be expected to hold more than a year or two. In all heated buildings the floor must be elevated above the ground level and insulated to minimize heat flow into the permafrost. Wooden piles have been used effectively for supporting small buildings. These are steam-jetted into place, the ground being thawed only enough to get them in. They are then allowed to "freeze-in" in place prior to loading. Near Barrow, wooden poles used for telephone and power lines seem to have no effect in increasing the depth of seasonal thaw around them.

It is again emphasized that prior to construction an analysis of the heat flow between the earth and the atmosphere must be made, and the effect of the structure on that heat flow should be determined. If necessary, artificial means of refrigeration can be used to prevent undue influx of heat into the ground beneath an important structure. This may be done by mechanical refrigerators (Gordon, 1937), but it is more economical to use the cold reserve of the adjacent permafrost or to utilize the cold reserve of the winter atmosphere (Huttl, 1948; Rathjens, 1951). As is well known, the specific heat, heat conductivity, and thermal diffusion qualities of different natural soils are markedly non-uniform (Kersten, 1949, and 1952) and must be taken into account. Once frozen, the unconsolidated materials, whether saturated or supersaturated, generally have ample strength to support most structures (Kersten and Cox, 1951).

In the emplacement of foundations, care must be taken to insure that very little water is trapped in the excavation to refreeze later. If much water is present, cryostatic pressure from freezing may heave the foundations.

Berger and Saffer (1953) have found that −6.5° C is the lowest possible temperature to which water with an interface of air and solid material can be supercooled. Ordinarily salt and other materials will lower the freezing point of soil mixtures well below that temperature. Brine is found at shallow depths in many drill holes throughout the Arctic Coastal Plain and must also be taken into account in emplacement of foundations. For example, an apparently anomalous situation in northern Alaska is recorded by Terzaghi (1952, p. 14-15) in which soft plastic clay from a depth of 25 to 35 feet and at a temperature of −15° C was unfrozen but separated by ice lenses. The clay became frozen on exposure to slightly warmer air temperature after being removed from the ground. Presumably, brine contaminating the deposit was concentrated by freezing of water into lenses

of ice so that the clay was kept from freezing. On exposure to air the brine drained off and permitted the clay to freeze.

Roads and runways

The lack of suitable construction material for roads, except very locally in the Arctic Coastal Plain Province, and the lack of economic incentive probably mean that few if any permanent roads will be built for a long time to come. Within the Navy camp near Barrow the beach gravel required the addition of some turf and silt from the tundra to bind it for use by wheeled vehicles. Without a binder the pebbles rolled like marbles under the wheels of the vehicles. However, the organic and fine-grained material prevented thorough drainage, so that during heavy rains in the summer, the road became a quagmire (Fig. 2).

Fig. 2. Main street of the U. S. Navy camp near Barrow after a moderate to heavy rain. August 23, 1946.

A steel landing mat is used on the gravel beach for a landing strip at the camp, but a binder is needed to prevent small grains of sand and gravel from being picked up by propeller wash. Concrete is used at the warm-up apron. Neither affects the underlying permafrost adversely. In an area of sand dunes 30 to 60 miles south of Barrow, small airstrips can be made with little grading and with little danger that permafrost, and therefore foundation stability, will be affected. Former ocean-beach ridges, recently

abandoned lake terraces, and other natural bars and beaches with only slight to moderate grading are suitable as airstrips for small planes, which leaves the permafrost essentially unaltered. Stripping of vegetation over areas of much ground ice, however, results in differential thaw and collapse of the ground by as much as several feet (Fig. 3).

In areas removed from a suitable source of gravel or sand, a frozen runway of pycrete (Perutz, 1948) or icecrete (Roberts, 1950) utilizing turf and surface soil as the foundation material and permafrost as a cold reserve in a heat exchanger is recommended for permanent runways.

Pipe lines

Pipe lines on the surface offer no special problems other than those familiar to any engineer, where extreme cold, snow, and rapid spring run-off are found. Pipes buried in the ground present special problems in the Arctic Coastal Plain. The writer has shown by field measurements (Black, 1952) that contraction of the ground takes place each winter as though the ground were composed of pure ice with a thermal coefficient of about 50 x 10^{-6}. Where contraction cracks are produced, as in all areas of ice wedges, the effects are at least partly cumulative annually. Adfreeze strength of fine-grained saturated materials is sufficient to cause most pipes to be pulled apart by the winter contraction, unless they are protected by material with low adfreeze strength. Slower vertical movements adjacent to ice wedges, over a period of several years, heave pipes out of level.

Steam lines or other heated pipes in the ground thaw permafrost, which results in the collapse of the ground (Fig. 4) if ice is present. Utilidors are required for their protection.

Water supply and sewage

Potable ground water, except in the beds of the larger rivers and lakes, is absent in the coastal plain of northern Alaska (Black, pp. 118-119 in Hopkins, Karlstrom, *et al.*, 1955); shallow wells within permafrost have always encountered saline water in and below permafrost. Potable water is trapped on permafrost in many lakes dotting the coastal plain. Lakes more than 6 feet deep do not freeze to the bottom in winter and can be used, at least to a limited extent, throughout the year. A very small amount of water can be obtained from the active layer during summer, even in some of the off-shore bars, although the water generally contains much organic matter and dissolved salts. The occurrence and development of ground water in areas of permafrost, including especially methods of drilling, are treated by Cederstrom, Johnston, and Subitzky (1953), and need not be reviewed here.

In areas of permafrost the cold climate and low ground temperature present problems in water purification, filtration, and distribution (Alter, 1950a, b; Crockwright, 1947; and Hyland and Reece, 1951). At Barrow it has been found convenient to use a heated wagon and tractor to distribute

Fig. 3. Removal of the turf covering ice-wedge polygons has resulted in the thaw of ice wedges and a slump of the surface of as much as 6 feet. Weasel tracks (M29c) give the scale. Near Barrow, August 25, 1947.

Fig. 4. Slump in the gravel street at the U. S. Navy camp near Barrow along a heated sewage line. The thaw penetrated more than 7 feet and the surface dropped more than 2 feet in 2 years. May 17, 1950.

water to buildings housing from 200 to 500 men. In other places heated utilidors are more convenient or economical for water and sewage lines (Muller, 1947; Roche, 1948; and Hyland and Mellish, 1949). Individuals and small groups of people commonly use melted ice and snow in winter and store ice for summer use.

Because surface water has to be used in northern Alaska, extra care must be exercised to avoid contamination. Sewage disposal presents a problem not now within easy reach of solution. Inland, where natural gas or coal are available in quantity, the liquid sewage can be boiled or evaporated and the solids burned. For installations adjacent to the coast, the ocean offers the only safe outlet. Few rivers can be used as outlets for sewage disposal from large installations, unless the use of drinking water below the sewage outlet is not considered.

Drilling for and production of oil and gas

Drilling for oil and gas in the Arctic Coastal Plain has introduced problems in logistics and in mechanics of operation not encountered in temperate regions (Fagin, 1947). As pointed out earlier, permafrost directly and indirectly creates difficulties in overland transportation in the supplying of well-drilling camps (U.S. Navy, 1948-1949a and b). By virtue of its cold temperature, permafrost also adversely affects drilling operations within it. For example, the cold reduces the viscosity of drilling muds, and during periods of idleness the drill string can "freeze-in". The normal drilling problems in permafrost areas are augmented when the high ground temperatures at depths of several thousand feet are transmitted to the permafrost by the drilling mud, thawing the permafrost adjacent to the hole and under the drilling platforms. Artificial heat exchange then must be resorted to (Rathjens, 1951) in order to maintain the foundations of the drill rig.

Similarly, production of gas and petroleum from below or within permafrost creates problems not generally found outside northern Alaska (or other arctic areas), and the problems require solutions that are not yet available or standardized. For example, moisture within gas tends to freeze on the inside of pipes on passing through permafrost, and the ice eventually seals off the flow. Effective pore space in rocks within permafrost is reduced by ice so that capacity and ability to yield oil and gas are reduced. Furthermore, spicules, cement between grains, and other forms of ice in openings in the rock effectively reduce permeability, and the minute crystals of ice within the oil may be filtered-pressed off around the producing well, preventing delivery of oil to the pipe. However, permafrost may substitute for a cap rock for petroleum and gas where no other cap exists.

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INSTITUTE NEWS

The 1957 Institute Library report

In September 1957, the library was moved from two rooms on the second floor of the Institute to the one large room on the main floor, which had formerly housed the museum. Being more accessible to the students and public in this location, the circulation records have increased over last year.

Circulation	*1956*	*1957*
Books	489	621
Reprints and pamphlets	131	244
Periodicals	285	266
Inter-library loans lent	77	135

The total circulation for 1957 is more than double that of 1955. Thirty-six items were borrowed on inter-library loan, in comparison to 26 of the year before. No record of use has been kept because of the library's open shelves and small study area.

Accessions	*Received 1957*	*Total*
Volumes	203	2,299
Pamphlets and reprints	382	
Periodicals, subscription	25	
Periodicals, exchange	145	
Periodicals, complimentary	65	
Maps	1,117	4,410

The accessioned volumes now total 2,299, 649 having been added during the year. Of the 235 serial publications, 65 are complimentary, 25 are subscribed to, and the rest are received in exchange for *Arctic*.

All of the back-log of cataloguing has been completed, and more than half classified and added to the working collection. Over 1000 items were processed during the year.

The public catalogue was increased by 4,888 cards, making a total of 17,538 cards in the "new" catalogue. Seven hundred and thirty author cards were sent to the Bibliographic Centre, Public Archives, in Ottawa, for inclusion in the Union Catalogue. The Institute is now represented by 2,586 items in this catalogue, and as the number increases the attention of more people will be drawn to the Institute. The library also furnished the Library of Congress, in Washington, with a list of its holdings of serials with beginning dates after December 31, 1949. These are listed in the Library of Congress's monthly publication *New Serial Titles*.

Complimentary copies of the following serial publications have been gratefully received during the past year:

Alaska Resource Development Board. Biennial Report.

Alaska Resource Development Board. Estimate of Alaska Population.

Alaska University. Agricultural Experiment Station. Bulletins.

Alaska University. Agricultural Experiment Station. Circulars.

Alaska University. Agricultural Experiment Station. Extension Circulars.

Alaska University. Progress Reports. Alaska University. Extension Service. Bulletins.

British Glaciological Society. Glaciological Research Sub-committee. Technical Notes.

Building Research in Canada.

Canada. Defence Research Board. Translations.

Canada. Department of Transport. Canada Air Pilot — East.

Canada. Northern Canada Power Commission. Annual Report.

Canada. Water Resources Division. Water Resources Papers.

Canadian Geophysical Bulletin.

C. I. L. Oval.

Dania Polyglotta.

Falkland Islands and Dependencies. Meteorological Service. Annual Meteorological tables.

Farthest North Collegian.

Finlandia Pictorial.

Greenland. Landslaegen. The State of Health in Greenland.
Hudson's Bay Record Society. Publications.
Instituto Antartico Argentino. Boletin.
Instituto Antartico Argentino. Contribucion.
Instituto Antartico Argentino. Publicacion.
I. G. Y. Bulletin.
International Commission for the Northwest Atlantic Fisheries. Annual Proceedings.
International Commission for the Northwest Atlantic Fisheries. Statistical Bulletin.
J. L. News.
McGill University. Arctic Meteorology Research Group. Publications in Meteorology.
Mountain World.
Munich. Technische Hochschule. Geographisches Institut. Munchner Geographische Hefte.
National Bank of Iceland. Statistical Bulletin.
Northern Affairs Bulletin.
Norwegian-British-Swedish Antarctic Expedition, 1949-52. Scientific Reports.
Northwest Territories. Ordinances.
Northwest Territories. Power Commission. Annual Report.
Reykjavik. University. Research Institute. Department of Agriculture. Reports, Series A.
Reykjavik. University. Research Institute. Department of Agriculture. Reports, Series B.
Reykjavik. University. Research Institute. Department of Fisheries. Reports.
The Roundel.
Sapporo, Japan. Hokkaido University. Faculty of Science. Journal (Series VII — Geophysics).
Scan: a monthly review.
Screenings from the Soil Research Laboratory.
Sociedad Geofrafica de Lima. Boletin.
Soviet News Bulletin.
U. S. S. R. Embassy in Canada.
U. S. S. R. Illustrated News.
U. S. Quartermaster Corps. Environmental Protection Research Division. Technical Reports.
Wildlife Management Bulletin. Series One.
Wildlife Management Bulletin. Series Two.
Yukon Territory. Ordinances.

Gifts to the Library

The Institute Library gratefully acknowledges gifts of books and reprints from the following persons and organizations:

T. E. Armstrong
T. Arnberg
R. N. Drummond
J. T. Flakne
D. Foote
E. Goedecke
J. R. Letz
E. P. Wheeler
J. W. Wilson
Canada. National Research Council. Division of Building Research.
Canada. Department of Northern Affairs and National Resources. Northern Affairs Library.
Hudson's Bay Company.
U. S. S. R. Embassy in Canada.

The Northeast Wildlife Conference

The Northeast Wildlife Conference was held in Montreal, January 5-7. On the afternoon of January 6 the Institute sponsored and organized two concurrent sessions covering arctic wildlife. One session covered terrestrial game; the other marine animals. At another session, G. Power, Carnegie McGill Arctic scholar and Banting grantee, presented a paper on fishes. The members on the terrestrial game panel were: Winston Mair, Chairman; A. W. Banfield; G. Cooch; L. Lemieux; A. Macpherson, and J. Teal. Those on the marine panel were M. J. Dunbar, Chairman; W. Black; J. G. Hunter; E. M. Grainger; A. Mansfield; I. A. McLaren, and D. E. Sergeant.

The Institute also had an exhibit in the General Exhibition. This presented material loaned by the National Museum of Canada which illustrated work by A. Macpherson and T. H. Manning. In addition there were photographs and a continuously changing presentation of colour slides showing arctic wildlife.

NORTHERN NEWS

Geomorphological investigations in the Torngat Mountains of northeastern Labrador-Ungava

The writer, assisted by his wife, worked for a second summer season in the northeastern part of Labrador-Ungava, continuing and expanding the program of work initiated in 1956. The central area of study lay athwart the Labrador-Quebec boundary on the watershed between Nakvak Brook, which drains into Saglek Fiord, and the Koroksoak (Korok) River, which flows westwards into Ungava Bay.

As in the previous season, the party was able to use the main base of the British Newfoundland Exploration Company at North West River, and, once again, difficulty was experienced with a very late break-up which delayed departure for the southern Torngat Mountains until late July. The preceding month was spent at the head of Canairiktok Bay, southwest of Hopedale, and on an unnamed lake at 55° N some 60 miles to the west of Hopedale. This opportunity was used to study the glacial geomorphology of these areas which provided interesting contrasts to the Torngat Mountains.

The party was picked up by Beaver aircraft on July 27 and, after refuelling on Kingurutik Lake to the north of Nain, a successful landing was made on a small lake in the great east-west trough through which runs Nakvak Brook. A base camp was established here, and late the same afternoon a food and fuel cache was flown into another small lake, situated about 30 miles southwest of the base camp, and which drains into the main south bank tributary of the Koroksoak. The most intensive work of the summer was carried out from a series of temporary camps between these two bases, while longer excursions were made radially from each of the bases.

The first seven days in the area provided a series of fine, sunny skies and allowed a period of intensive work. Last summer's experience of Torngat weather gave warning that the utmost should be made of such favourable conditions. Bad weather was to hinder work for the remainder of the summer.

Attention was concentrated on an extensive system of lateral moraines and kame terraces which slope eastwards from the watershed towards the head of Saglek Fiord. Similar systems were examined in the through-troughs to the south. The whole complex represents the late-Pleistocene limits of trunk glaciers flowing through the mountains towards the east and supplied by an ice cap of continental proportions west of the height of land. At this stage the higher summits stood as nunataks well above the level of the ice, and an extensive series of ice-dammed lakes was held against the western slopes of the highland finding outlets over ice-free cols into the Atlantic.

Detailed studies in the watershed area provide a chronology of the final emergence of the area from the last ice sheet, and the draining of the ice-dammed lakes. A final stage was represented by a mass of ice in the lower valley of the Koroksoak which dammed a lake to the level of the col, at 1,050 feet, whence it drained into Nakvak Brook and ultimately into the Atlantic.

Glacial erratics, found on summits up to 4,000 feet above sea level, corroborate the conclusions of the previous summer's work[1] suggesting that at some stage the highest summits were inundated by ice flowing from the west.

[1]Ives, J. D. 1957. Glaciation of the Torngat Mountains, northern Labrador. Arctic 10: 67-87.

The data compiled from the two summers' work prompt the conclusion that during late-Pleistocene times the Torngat Mountains were influenced by two distinct glaciations, separated by an interglacial period of considerable intensity. The final glaciation, during which large areas remained ice-free, is tentatively correlated with the "classical" Wisconsin of central North America[1] whereas the date of the preceding glacial period is uncertain. It may be the equivalent of the Illinoian Glaciation, or even be of post-Sangamon age, and in this case be comparable with a cold phase tentatively identified in central North America, which is older than the "classical" Wisconsin Glaciation, and is separated from the latter by a warmer period.

Reconnaissance from the air during flights along the Labrador coast and some distance inland suggests that these general conclusions might well be applicable to the entire coastal zone of Labrador. Farther south, however, it is anticipated that the small mountain groups, such as the Kaumajet, Kiglapait and Mealy Mountains, might prove to be more important centres of local late-Wisconsin glacierization, as in that direction precipitation is heavier today, and probably was in the past.

The Beaver aircraft returned to base camp on September 8 and the party was flown to Knob Lake via Nain.

The work was made possible by a grant from the Banting Fund, provided through the Arctic Institute of North America, and by the provision of air transport by the British Newfoundland Exploration Company. This work will be written up in full during the present winter at the McGill Sub-Arctic Research Laboratory.

J. D. IVES

[1]Flint, R. F. 1957. Glacial and Pleistocene Geology. New York: John Wiley and Sons. 553 pp.

Arctic investigations by the Fisheries Research Board of Canada, 1956-57

The work of the former Eastern Arctic Investigations, now the Arctic Unit, was extended in 1955 to cover the entire Arctic. In 1956 and 1957 five parties carried out arctic field investigations between Herschel Island and Frobisher Bay. In addition, marine mammal studies continue off Newfoundland and in the Gulf of St. Lawrence.

Fisheries investigations. In 1956 fisheries studies were concentrated in the Mackenzie Delta region between Herschel Island and Tuktoyaktuk, where fishes are relatively varied and abundant. A party worked at Whitefish Station, near Tuktoyaktuk, from July 7 to September 15, and another worked at the mouth of the Firth River, Y. T., from July 27 to August 10 and at King Point Harbour, just east of this, from August 12 to August 30. In addition to substantial beluga and ringed seal collections which were made for the mammal investigations, about 11,000 fish were sampled in all. In co-operation with the Canadian Wildlife Service, a preliminary survey of fish stocks in Pelly and Garry lakes of the Back River system was undertaken from August 2 to August 23. The lakes, which are shallow (20-30 feet), were found to support sufficient stocks of whitefishes and lake trout to permit organized subsistence fishing should this be necessary.

In 1957 one party carried out fisheries studies up the Mackenzie River from Aklavik to Fort Norman, and another surveyed fish stocks at Coppermine, N.W.T. An intensive study was made of the char run in Rowley River on Rowley Island, Foxe Basin by the M.V. *Calanus* and in northern Hudson Bay by whaleboat and by peterhead from Coral Harbour. Forty-five walrus were tagged in the latter area, and 20 were examined in detail. In Foxe Basin 60 walrus and 220 seals were sampled. The reproductive cycle, ages at maturity, and life expectancy have to a large extent been clarified by work on aging from growth layers in the cementum of molar teeth and in tusk development.

At Herschel Island, a 7-inch mesh nylon fish gill-net was found to be four times as successful in netting ringed seals as the traditional larger mesh, heavy cotton-twine nets.

In 1957, excessively heavy ice conditions in Foxe Basin hampered walrus investigations in Foxe Basin to such an extent that only a few specimens were obtained. The party engaged in this work was forced to remain shore bound on Amitioke Peninsula for most of the season.

In 1956 and 1957, a continued increase in the fishery for pilot whales in Newfoundland (1956 catch, about 10,000) led to emphasis on population studies. Investigations were begun as well on minke whales or lesser rorquals, with a small fishery at Dildo, Newfoundland as the source of material.

Biological oceanography. During a 12-month period beginning in September 1955, collecting of plankton, benthos and hydrographic samples was carried out in northern Foxe Basin from the M.V. *Calanus,* based at Igloolik. Biological samples included net plankton, microplankton, bottom fauna and intertidal collections. Hydrographic sections were run across Fury and Hecla Strait, and between Jens Munk and Koch, Koch and Rowley, Koch and Baffin, Baffin and Bray, and Bray and Rowley Islands. Additional stations were occupied and water temperature, salinity, oxygen and phosphate values were determined. It thus has been possible to follow through a complete yearly cycle of hydrography and productivity in Foxe Basin.

The M. V. *Calanus* broke free of ice at her winter quarters at Igloolik on July 31, 1956. It was decided to winter her again in Foxe Basin, rather than bring her south to Churchill at the end of the summer, in order to get a more profitable working period in the Basin. No party stayed over winter this time, and the ship was beached on Rowley Island on September 19. A party stayed aboard the ship from May to September 1957, but the heavy ice conditions mentioned above made it impossible to move the ship and she remains for a further winter on Rowley Island. In addition to the char study, the party carried out a program of hydrography, plankton and bottom sampling during their stay on the ship.

The results of work written up since the last report (*Arctic,* Vol. 8, No. 2, 1955) can be found in the following reports of the "Calanus" Series:

Dunbar, M. J. 1957. The determinants of production in northern seas of *Themisto libellula* Mundt. Can. J. Zool. "Calanus" Series No. 14. In press.

————1958. Physical oceanographic results of the "Calanus" expeditions in Ungava Bay, Frobisher Bay, Cumberland Sound, Hudson Strait and northern Hudson Bay. J. Fish. Res. Bd. Can. "Calanus" Series No. 15. In press.

Grainger, E. H. and M. J. Dunbar. 1956. Station list of the "Calanus" expeditions, 1953-4. J. Fish. Res. Bd. Can. 13 (1): 41-45. "Calanus" Series No. 10.

McLaren, I. A. 1958. Biology of the ringed seal *(Phoca hispida Schreber)* in the eastern Canadian Arctic. Bull. Fish. Res. Bd. Can. "Calanus" Series No. 12. In press.

————1958. Some aspects of growth and reproduction of the bearded seal, *Erignathus barbatus* (Erxlesen). J. Fish. Res. Bd. Can. "Calanus" Series No. 13. In press.

Squires, H. J. 1957. Decapod crustacea of the "Calanus" expeditions in Ungava Bay, 1947 to 1950. Can. J. Zool. 35: 463-494. "Calanus" Series No. 11.

H. D. FISHER

Carnegie program of arctic research

In 1956 the Carnegie Corporation of New York approved an $88,000 renewal of its grant for arctic studies at McGill University. This new grant was to be used in a further five-year scholarship program, along fairly similar lines to those of the previous five-year period. The original (1951) Carnegie grant had included a Senior Fellowship each year in addition to several graduate scholarships, and some support of the Arctic Institute and its library. As a result of the first Carnegie grant for arctic studies, thirty-three scholarships were granted and these have resulted, so far,

in twenty M.Sc. and Ph.D. degrees.

The second grant does not include funds for a Senior Fellowship each year, but there is continued support for the library of the Arctic Institute, which is used extensively by the McGill Carnegie students. In the summer of 1956, at the beginning of the second program, ten scholars were in the field, ranging from the northeast part of Labrador to Aklavik and from Contwoyto Lake to Nettilling Lake. The fields of investigation were glacial geology, marine biology, physiography, limnology and fresh water biology, economic geography, and ornithology. In the summer of 1957 three Carnegie scholars and several of the previous years' grantees did field work in the North: C. I. Jackson, a United Kingdom citizen, worked out of McGill's Knob Lake laboratory on problems of short-wave radiation and reflection from the ground. His field work is part of a longer-term McGill program of research in micro-meteorology in the subarctic. Jackson later joined the McGill group of graduate students that are making up the winter party on the Canadian Defence Research Board's Expedition to Lake Hazen, Ellesmere Island, during the International Geophysical Year. M. T. Millett, a U. S. citizen, joined a party from the American Geophysical Society to Alaska, where his field work was part of International Geophysical Year investigations of glaciers and glacial geology. Finally, D. Steele, a Canadian, spent the summer on the Labrador coast, collecting and investigating anthipods.

SVENN ORVIG

Activities of the Geographical Branch in northern Canada, 1947-1957[1]

The Geographical Branch of the Department of Mines and Technical Surveys was created in 1947. Under its terms of references, part of its responsibility is the collection and analysis of geographical information on northern Canada, in particular the territories under the jurisdiction of the federal government.[1] In the decade since the Branch's inauguration, geographers have carried out various kinds of field surveys in the Canadian Arctic and subarctic, from the northern coast of Ellesmere Island to the Hudson Bay coastal plain in Ontario, and from the Alaska boundary to Labrador. These surveys have varied from parties formed entirely of geographers to individual shipboard observers or representatives on collaborative teams of scientists.

The collection of basic information on the vast unknown expanses of the Arctic is peculiarly suited to the application of geographic methods. Utilizing the trimetrogon and vertical photography carried out since World War II, geographers have applied sampling techniques in interpreting larger areas, making intensive field studies of representative terrain types and expanding them by use of the air photos in delimiting, describing and analysing physiographic regions. Studies in physical geography have been the backbone of the work of the Branch in the Arctic. Air photo interpretation keys have been prepared for 14 areas: Alert, Eureka, Mould Bay, Resolute, Mackenzie Delta, Darnley Bay, Coppermine, Bathurst Inlet, Boothia Isthmus, Wager Bay, Southampton Island, Kaniapiskau-Koksoak Rivers in Ungava, the Hudson Bay Railway, and the Kenogami River. Reports on the human geography of various areas were included in the field reports and are mainly unpublished; several studies in historical geography also resulted from the field surveys.

The choice of areas investigated in the first few years of Branch field activities was dictated partly by the requirements of federal government departments, partly by the presence of settlements which could be used as bases for operations, partly by the staff available and partly by the availability of air photo coverage. Because of these limitations, it was only in recent years that an integrated regional program of research could be established, allowing geogra-

[1]Published with the permission of the Director, Geographical Branch, Department of Mines and Technical Surveys, Ottawa.

[1]Nicholson, N. L. 1957. The Geographical Branch, 1947-1957. Can. Geog. No. 10: 61-68.

phers to specialize regionally. It is expected that this specialization will continue, to the end that regional monographs may be prepared after a number of years of field study in each of several regions.

Collaborative surveys with other scientists and organizations. Collaborative surveys were initiated early in the history of the Branch, mainly for reasons of convenience and transportation costs. J. L. Jenness was attached to a scientific party including specialists in geodesy, geophysics, and botany, travelling by Canso aircraft in the western Arctic in 1948 and 1949.[1] B. Shindman accompanied another Canso party in 1949 in the western Arctic and in the same year, the Branch supported the NAUJA expedition to Foxe Basin.[2] The NAUJA group was led by T. H. Manning and included C. L. Merrill, geographer and engineer, R. W. Packer, geographer, D. B. Coombs, geographer and surveyor, C. A. Burns, geologist, W. K. W. Baldwin, botanist and A. W. Macpherson, cook and assistant zoologist. In 1948, P. Gadbois was attached to a party which crossed northwest Ungava by canoe from Povungnituk to Payne Bay,[3] and in 1951, Gadbois and J. S. Tener of the Canadian Wildlife Survey worked together in the vicinity of Eureka. The Branch assigned J. K. Fraser as the departmental representative on the Aklavik Relocation Survey team in the Mackenzie Delta in 1954.[1] W. G. Ross was employed by the Branch in 1957 to accompany M. Marsden of McGill University in a survey of the Baffin Island coast along northern Foxe Basin.

Observers on government and H.B.C. vessels. Geographers have accompanied ships on the joint Canada-U. S. Weather Stations Resupply Mission in the eastern Arctic from time to time, namely R. T. Gajda and T. R. Weir in 1948, Gajda in 1949, D. W. Kirk in 1950, R. J. E. Brown and L. Prior in 1951, W. C. Wonders in 1952, and W. A. Black in 1956 and 1957.[2] In 1948, G. A. Wood travelled on the Hudson's Bay Company vessel *Rupertsland* in the eastern Arctic and J. K. Fraser on tugs of the Northern Transportation Company on the Mackenzie River and the Hudson's Bay Company vessels *Fort Ross* and *Nigalik* in the western Arctic.[3]

In 1948, T. Lloyd (then head of the Branch) visited Resolute Bay on Cornwallis Island. D. W. Kirk was killed in 1950 in the crash of an RCAF Lancaster at Alert. In 1953 and 1954, N. L. Nicholson, then assistant director, visited field parties on Boothia Peninsula and in the Mackenzie Delta respectively.

Regional surveys composed of federal geographers. In 1948, J. B. Bird, accompanied by W. G. Dean, A. H. Laycock, and M. B. Bird, began his field studies in the central Arctic, working along the chain of lakes between Baker Lake and

[1]Jenness, J. L. 1952. Erosive forces in the physiography of western arctic Canada. Geog. Rev. 42: 238-252.

————1952. Problem of glaciation in the western islands of arctic Canada. Geol. Soc. Amer. Bull. 63: 939-952.

————1953. The physical geography of the waters of the western Canadian Arctic. Geog. Bull. No. 4: 32-64.

[2]Baldwin, W. K. W. 1951. Biological investigation of the 1949 Foxe Basin Expedition. Ann. Rept. Nat. Mus. Can., 1949-50 (Bull. No. 123), pp. 162-165.

Burns, C. A., and A. E. Wilson. 1952. Geological notes on localities in James Bay, Hudson Bay and Foxe Basin visited during an exploration cruise, 1949. Geol. Surv. Can. Paper 52-25, 16 pp.

Fraser, J. K. 1953. The islands in Foxe Basin. Geog. Bull. No. 4: 1-31.

[3]Gadbois, P. 1949. De la baie d'Hudson à la baie Ungava. L'Actualité Economique 25: 300-322.

[1]Fraser, J. K. 1956. Physiographic notes on features in the Mackenzie Delta area. Can. Geog. No. 8: 18-23.

[2]Black, W. A. 1957. A report on sea ice conditions in the eastern Arctic, summer 1956. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Geog. Paper No. 9, 21 pp.

[3]Fraser, J. K. 1949. Summer journey down the Mackenzie and along the western Arctic Coast, 1948. Arctic Circ. 2: 11-13.

Beverley Lake in the District of Keewatin.[1] In 1950, Bird, with Dean, M. B. Bird and W. D. Bell, traversed the southern coasts of Southampton Island,[2] and continued this study in 1952 with M. B. Bird in the Wager Bay-Repulse Bay area.[3] In 1954, J. B. and M. B. Bird worked in the Bathurst Inlet area,[4] and M. Marsden and G. Falconer traversed the mainland coast of Coronation Gulf between Rae River and Port Epworth, working from the settlement at Coppermine. These studies were extended in 1956 when J. B. Bird and M. Marsden investigated the area surrounding Contwoyto Lake.

The Mackenzie Delta and adjacent coastlands studies were begun in 1951 when J. R. Mackay, assisted by J. K. Fraser, carried out investigations in the Darnley Bay area.[5] Mackay continued this work in 1954, assisted by J. K. Stager and V. W. Sim, on the Geographical Branch schooner *Tuhlik* in the Delta and the Eskimo lakes.[1] In 1955, Mackay, with J. K. Stathers, travelled in the *Tuhlik* from Aklavik to Cape Bathurst, investigating the Liverpool Bay area and the lower Anderson River.[2] The *Tuhlik* was again utilized in 1957 when Mackay, with W. E. S. Henoch and W. C. Wallace, traversed the coast from the Delta to past Herschel Island.

Studies of the central Arctic Coast and adjacent islands were commenced by J. K. Fraser in the spring and summer of 1953 in the Boothia Isthmus area, accompanied by C. Laverdière.[3] In 1955, Fraser and B. Frebold studied the southeastern coastlands of Victoria Island, working from Cambridge Bay. Assisted by W. E. S. Henoch, Fraser worked along the south coast of King William Island in 1956 and carried out investigations in Sherman Inlet.[4]

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[1]Bird, J. B. 1951. Physiography of the middle and lower Thelon Basin. Geog. Bull. No. 1: 14-29.

———1953. The glaciation of central Keewatin, N.W.T. Amer. J. Sci. 251: 215-230.

Dean, W. G. 1953. The drumlinoid features of the Barren Grounds, N.W.T. Can. Geog. No. 3: 19-30.

[2]Bird, J. B. 1953. Southampton Island. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Mem. No. 1, 84 pp.

[3]———1954. Postglacial marine submergence in central arctic Canada. Geol. Soc. Amer. Bull. 65: 457-464.

———1955. Terrain conditions in the central Canadian Arctic. Geog. Bull. No. 7: 1-16.

[4]———1955. Postglacial emergence of the land around Bathurst Inlet, N.W.T. Can. Geog. No. 6: 7-12.

———and M. B. Bird. 1957. Notes on potential building sites in Bathurst Inlet area, N.W.T. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Geog. Paper No. 8, 13 pp.

[5]Mackay, J. R. 1952. Physiography of the Darnley Bay area, N.W.T. Can. Geog. No. 2: 31-34.

———1953. Post-glacial drainage changes in the Darnley Bay area, N.W.T., Canada. Yearbook Assoc. Pacific Coast Geog. 15.

———Anderson River map area. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Mem. No. 5. In press.

Fraser J. K. 1952. Identification of Petitot's Rivière La Roncière-le Noury. Arctic 5: 224-234.

[1]Mackay, J. R. 1956. Mackenzie deltas — a progress report. Can. Geog. No. 7: 1-11.

Stager, J. K. 1956. Progress report on the analysis of the characteristics and distribution of pingos east of the Mackenzie Delta. Can. Geog. No. 7: 13-20.

[2]Mackay, J. R. 1956. Deformation by glacier ice at Nicholson Peninsula, N.W.T., Canada. Arctic 9: 219-228.

———1956. Notes on oriented lakes of the Liverpool Bay area, N.W.T. Revue Can. de Geog. 10: 169-174. Comment and reply in: Revue Can. de Geog. 11: 175-178.

———1957. Notes on small boat harbours, N.W.T. Ottawa: Dept. Mines and Tech. Surv., Geog. Branch, Geog. Paper No. 13, 11 pp.

[3]Fraser, J. K. 1957. Tracing Ross across Boothia. Can. Geog. No. 10: 40-60.

[4]———1957. Notes on birds observed in the central Canadian Arctic, 1953, 1955, and 1956. Can. Field-Nat. 71: 192-199.

Regional studies were made in the Queen Elizabeth Islands in the vicinity of the weather stations. Following Gadbois' field work at Eureka in 1951, he and C. Laverdière spent the summer of 1952 at Alert.[1] In the same year, J. R. Mackay and J. K. Stager carried out studies in southern and western Cornwallis Island.[2]

The Mould Bay area was investigated in 1955 by B. Robitaille and L. Hudon, while V. W. Sim and M. Marsden extended the Eureka study.[3] Robitaille and J. G. L. Trotier worked in eastern Cornwallis Island in 1956.

Studies were recommenced in the Foxe Basin area in 1957, when V. W. Sim and D. Bissett investigated the northern part of Melville Peninsula, W. G. Ross and M. Marsden worked in northern Foxe Basin and B. Robitaille and H. Wargon spent the summer studying the coastal areas of Foxe Peninsula on Baffin Island.

Subarctic field investigations. Summer surveys along the fringe of the Arctic include those of W. G. Dean on the Kenogami and Albany rivers in northern Ontario,[4] R. N. Drummond on the Kaniapiskau and Koksoak rivers in Ungava and H. A. Wood and V. W. Sim along the Hudson Bay Railway in Manitoba,[5] all in 1952. In 1949, Barbara Gutsell and Lera Lake travelled along the Yukon River,[1] and P. Gadbois and I. A. Mackay spent the summer of 1950 in the Mealy Mountains of southern Labrador.[2] W. A. Black carried out economic studies along the Labrador coast in 1950 and 1952.[3]

Office studies pertaining to the Arctic. Various studies involving archival research and photo interpretation have been carried on for some years in the Branch. The Canadian Ice Distribution Survey originally included northern waters only and was later extended to conditions in the Gulf of St. Lawrence and inland waters.[4] The extraction of terrain information from overt published sources is a continuing project in which such information is plotted on the National Topographic Series maps (1:508,660) and cross-indexed on cards. A special project involved the preparation of a series of maps showing relative relief and surface materials for use in the planning of the Distant Early Warning Line.

A booklet on the general geography of the Canadian Arctic was published in 1951.[5] An issue of *Focus*, published by the American Geographical Society in 1952, was based on a manuscript by

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[1]Gadbois, P. and C. Laverdière. 1954. Esquisse géographique de la région de Floeberg Beach, nord de l'Ile Ellesmere. Geog. Bull. No. 6: 17-44.

[2]Mackay, J. R. 1953. Fissures and mud circles on Cornwallis Island, N.W.T. Can. Geog. No. 3: 31-37.

[3]Sim, V. W. Geographical aspects of weather and climate at Eureka, N.W.T. Geog. Bull. No. 10. In press.

[4]Dean, W. G. 1956. Glacial features of the Hearst-Cochrane map-sheet area. Can. Geog. No. 8: 35-45.

————————Human geography of the Albany River Basin. Geog. Bull. No. 10. In press.

[5]Sim, V. W. 1956. The Pas, Manitoba. Geog. Bull. No. 8: 1-21.

[1]Gutsell, Barbara. 1953. Dawson City. Geog. Bull. No. 3: 23-49.

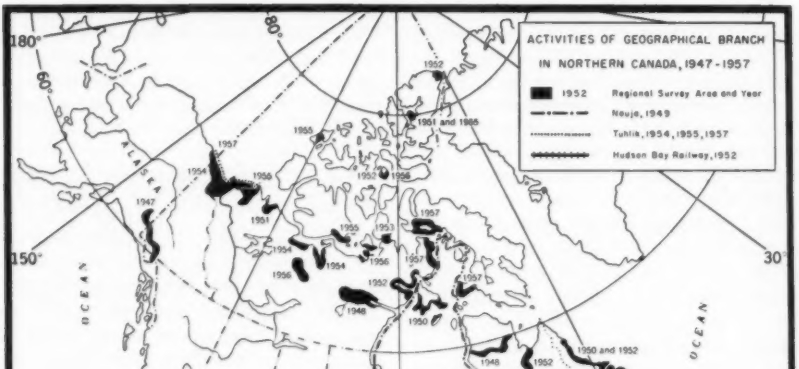
[2]Gadbois, P. and I. A. Mackay. 1954. A vegetation map of the Carter Basin area, Lake Melville lowlands, Newfoundland. Geog. Bull. No. 5: 1-3.

[3]Black, W. A. 1956. Population distribution of the Labrador coast, Newfoundland. Geog. Bull. No. 9: 53-74.

[4]Fraser, J. K. 1952. Canadian ice distribution survey. Arctic Circ. 5: 56. Reprinted in Arctic 5: 195.

Forward, C. N. 1956. Sea ice conditions along the Hudson Bay route. Geog. Bull. No. 8: 22-50.

[5]Robinson, J. L., *et al.* 1951. An introduction to the geography of the Canadian Arctic. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Infor. Series No. 2, xii + 118 pp.



Activities of the Geographical Branch in northern Canada, 1947-57.

N. L. Nicholson,[1] who, in 1953, contributed to a symposium on arctic mapping at the annual meeting of the American Society of Photogrammetry.[2] In 1954, an article on the Hudson Bay lowlands was published in the Geographical Bulletin, part of the research for which was carried out in the employ of the Branch in 1949.[3] Because of the interest in mining possibilities in northern Ungava, a special study based on reports and air photographs was published in 1955.[1] The Branch supported the publication in 1955 of a memoir on the discovery and exploration of the Queen Elizabeth Islands.[2] Studies in progress include those by F. A. Cook on patterned ground in Canada, its geographical distribution and the problems and techniques of studying it, and by J. K. Fraser on freeze-thaw cycles and their relation to mechanical weathering in Canada.

J. KEITH FRASER

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[2]———————1955. The contribution of explorers to the mapping of arctic North America. Panel on arctic mapping. Photogramm. Eng. 19: 380-385.

[3]Cooms, D. B. 1954. The physiographic subdivisions of the Hudson Bay lowlands south of 60 degrees north. Geog. Bull. No. 6: 1-16.

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[2]Taylor, A. 1955. Geographical discovery and exploration in the Queen Elizabeth Islands. Ottawa: Dept. of Mines and Tech. Surv., Geog. Branch, Mem. No. 3, 172 pp.

ELECTION OF FELLOWS

At the Annual Meeting of the Arctic Institute held in Montreal on December 7, 1957, the following were elected Fellows of the Institute:

Max Brewer, Arctic Research Laboratory, Box 1070, Fairbanks, Alaska.

Dr. John L. Buckley, Box 998, College, Alaska.

James Cantley, Apt. 492, 150 Driveway, Ottawa 4, Ont., Canada.

Laurence K. Coachman, Dept of Oceanography, University of Washington, Seattle, Wash., U.S.A.

J. L. Courtney, 173 Franklin Avenue, Willowdale, Ont., Canada.

A. P. Crary, Little America Station, Antarctica.

Miss I. M. Dunbar, 25 Cartier Street, Ottawa, Ont., Canada.

C. G. Goodbrand, 83 Yorkminster Road, Willowdale, Ont., Canada.

Andrew Macpherson, National Museum, Ottawa, Ont., Canada.

Dr. Terris Moore, North Wassalboro, Maine, U.S.A.

P. A. C. Nichols, Hudson's Bay House, Winnipeg, Man., Canada.

J. S. Tener, Canadian Wildlife Service, Ottawa, Ont., Canada.

Dr. Raymond Thorstainsson, Geological Survey of Canada, Ottawa, Ont., Canada.

Dr. E. Timothy Tozer, Geological Survey of Canada, Ottawa, Ont., Canada.

Dr. W. E. Stevens, Fort Smith, N.W.T., Canada.

George Watson, 260 35th Avenue, Lachine, P.Q., Canada.

Dr. Norman J. Wilimovsky, Fish and Wildlife Service, Juneau, Alaska.

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